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99th Congress, 2d Session - - - - - - - - - - - House Document 99-177

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HILO HARBOR, HAWAII

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

TRANSMITTING

A CORPS OF ENGINEERS REPORT ON THE HILO HARBOR, HAWAII, in partial response to Public Law 94-587, Section 144

MARCH 10, 1986.—Referred to the Committee on Public Works and Transportation and ordered to be printed with illustrations

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U.S. GOVERNMENT PRINTING OFFICE

58-296 O WASHINGTON : 1986

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LETTER OF TRANSMITTAL

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, DC 20310-0103

27 FEB 1986

Honorable Thomas P. O'Neill, Jr.
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

I am transmitting herewith a report dated December 4, 1984, from the Chief of Engineers, Department of the Army, on Hilo Harbor, Hawaii, together with other pertinent reports. These reports are in partial response to Section 144 of the Water Resources Development Act of 1976 (Public Law 94-587).

The views of the State of Hawaii, the Departments of the Interior, Agriculture, Transportation, and the Environmental Protection Agency are set forth in the enclosed communications.

I concur with the plan recommended in the report of the Chief of Engineers, subject to enactment of generic cost recovery legislation.

The Office of Management and Budget advises that there is no objection to the submission of this report to the Congress and that the Administration supports authorization of the project for construction contingent upon passage of cost-sharing legislation consistent with Administration policy. A copy of its letter is enclosed.

Sincerely,

Robert K. Dawson
Assistant Secretary of the Army
(Civil Works)

Enclosure

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COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

December 26, 1985

Honorable Robert K. Dawson
Assistant Secretary of the Army
for Civil Works
Room 2E570 - Pentagon
Washington, D. C. 20310

Dear Mr. Dawson:

We have completed our review of the report, and your recommendations on Hilo Harbor, Hawaii, as required under Executive Order 12322.

The Office of Management and Budget does not object to your submitting this report to the Congress. The Administration supports authorization of the project for construction in accordance with your recommendations, contingent upon passage of cost-sharing legislation consistent with Administration policy.

Sincerely,

Randall E. Davis
Associate Director
for Natural Resources,
Energy and Science

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COMMENTS OF THE STATE OF HAWAII

GEORGE R ARIYOSHI
GOVERNOR

RYOKICHI HIGASHIONNA, Ph D
DIRECTOR

DEPUTY DIRECTORS
WAYNE J YAMASAKI
JONATHAN K SHIMADA, Ph D
CHERYL D SOON

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

IN REPLY REFER TO:

STP 8.9447

October 18, 1983

Lieutenant General J. K. Bratton
Chief of Engineers
ATTN: DAEN-CWP
Department of the Army
Washington, DC 20314

Dear General Bratton:

Proposed Report of the Chief of Engineers on
Hilo Harbor, Hawaii, and a Final Environmental
Impact Statement

The proposal to deepen Hilo Harbor's entrance channel and turning basin and to modify their boundaries as outlined in the subject report meets with our approval. We also concur with the economic evaluation section which estimates that $311,000 would be nonfederal costs under the traditional cost sharing policies. However, we are well aware of attempts to have all Federal costs reimbursed by the local government for these types of projects, a concept which we cannot support economically.

The proposed improvements will allow for safer ship traffic movement in the harbor. In addition, existing and deeper draft vessels will be able to accommodate maximum cargo loads thereby resulting in more efficient operations and cost savings for the benefit of the island consumers.

The Hawaii State Department of Land and Natural Resources (DLNR), the agency responsible for fish and wildlife, is concerned about any adverse impacts to existing baitfish habitats which may be located within the project area. They have recommended that appropriate precaution be taken to mitigate the potential effects of turbidity and sedimentation during the proposed dredging operations. They also conclude that the selected Plan C is the most preferable of the alternatives proposed. These views, expressed by DLNR during the review of the November 5 2(b) Report on Hilo Deep-Draft Harbor Improvements, are still applicable and should be given proper consideration to avoid any undesirable environmental consequences during construction.

Thank you for this opportunity to provide comments.

Very truly yours,

Ryokichi Higashionna

Ryokichi Higashionna
Director of Transportation

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COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

November 9, 1983

ER 83/1143

Lieutenant General J. K. Bratton
Chief of Engineers
ATTN: DAEN-CWP
Department of the Army
Washington, D.C. 20314

Dear General Bratton:

Thank you for the letter of September 9, 1983, requesting our views and comments on the proposed report of the Chief of Engineers and final environmental statement for Hilo Harbor, Hawaii. We have no objection to the findings, conclusions, or the recommendations discussed in these documents.

Sincerely,

Bruce Blanchard, Director
Environmental Project Review

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COMMENTS OF THE DEPARTMENT OF AGRICULTURE

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C 20250

November 28, 1983

Lieutenant General Joseph K. Bratton
Chief of Engineers
Office of the Chief of Engineers
Army Corps of Engineers
U.S. Department of the Army
Washington, D.C. 20314

Dear General Bratton:

We appreciate the opportunity to review the reports on Hilo Harbor, Hawaii.

The reporting officers recommend deepening the 35-foot harbor to 39 feet at the entrance channel and 38 feet in the turning basin. They estimate the project cost to be $3.7 million and the benefit-cost ratio to be 2.0.

We note that navigation benefits are cost savings to one vessel hauling sugar. The savings are due to a new Integrated Tug and Barge operating at a draft of 34 feet rather than 31 feet.

Implementation of the project would not significantly impact sugar, pineapple, or diversified agricultural production in Hawaii.

Sincerely,

Richard E. Lyng

Richard E. Lyng
Acting Secretary

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COMMENTS OF THE DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
United States Coast Guard

Commandant
United States Coast Guard

Washington, DC 20593
Staff Symbol: G-WP
Phone: (202) 426-2262

2004

January 27, 1984

Lieutenant General J.K. Bratton
Chief of Engineers
Attn: DAEN-CWP
Department of the Army
Washington, D.C. 20314

Dear General Bratton:

The operating administration and staff of the Department of Transportation have reviewed the Chief of Engineers proposed report on Hilo Harbor, Hawaii.

Comments were forwarded from the Commander, Fourteenth Coast Guard District directly to the District Engineer, U.S. Army Engineer District, Honolulu. A copy of these comments are being forwarded for your information.

The opportunity to review this report is appreciated.

Sincerely,

W.R. RIEDEL
Chief, Planning, Coordination
and Analysis Staff
By direction of the Commandant

Enclosure

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(oan)

(308) 546 7130

16500
Serial 32008
12 JAN 1984

From: Commander, Fourteenth Coast Guard District
To: District Engineer, U. S. Army Engineer District, Honolulu

Subj: Hilo Harbor Survey Report and Final Environmental Impact Statement

1. Your recommended plan for navigational improvements in Hilo Harbor appears to indicate that the channel will be realigned, requiring possible relocation of channel buoys and the Hilo Harbor Range structures. The repositioning of buoys is relatively easily done by a Coast Guard buoy tender. Relocating the range structures, however, will be a major and costly project.

2. I recommend that you consider realigning the dredging limits to allow for the existing range alignment to be retained. Enclosure (1) illustrates my recommendation.

3. The installation of a submersible buoy to replace the mooring buoy in the turning basin will require the submission of a Private Aids to Navigation Application. I would like more information on the submersible buoy, such as: pictures or prints of the buoy, when it would be used, who will operate the buoy, how it will be marked when rising to the surface and when on the surface.

4. Thank you for the opportunity to comment on this report.

M. C. RICHARDS
By direction

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COMMENTS OF THE ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

November 7, 1983

Lieutenant General J.K. Bratton
Chief of Engineers
ATTN: DAEN-CWP
Department of the Army
Washington, D.C. 20314

Dear General Bratton:

The Environmental Protection Agency (EPA) has reviewed the Final Environmental Impact Statement (EIS) titled HILO HARBOR, HAWAII - DEEP-DRAFT NAVIGATION IMPROVEMENTS.

Our review indicates that the FEIS adequately assesses the environmental impact of the proposed action and responds to the concerns we raised on the Draft EIS.

As we noted in previous comments on the other Hilo area projects, all dredged materials from the Hilo area proposed for ocean disposal at the approved EPA site must undergo appropriate bioassay and bioaccumulation tests. We are especially concerned regarding the existing levels of arsenic, chlordane, and PCB found in the sediments. These constituents should be specifically analyzed in the bioaccumulation tests along with all other required parameters.

Thank you for the opportunity to review this FEIS. Please send us the Record of Decision when available. If you have any questions, please contact Loretta Kahn Barsamian, Chief, EIS Review Section, at (415) 974-8188 or FTS 454-8188.

Sincerely yours,

Charles W. Murray, Jr.
Assistant Regional Administrator
for Policy, Technical, and
Resources Management

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HILO HARBOR, HAWAII

REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO ATTENTION OF:
DAEN-CWP-A

December 4, 1984

SUBJECT: Hilo Harbor, Hawaii

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my interim report on Hilo Harbor, Hawaii. It is accompanied by the reports of the Board of Engineers for Rivers and Harbors and the District and Division Engineers. These reports are in partial response to Section 144 of the Water Resources Development Act of 1976, which authorized the Secretary of the Army, acting through the Chief of Engineers to undertake studies, including navigation, in Hilo Bay, Hawaii.

2. The District and Division Engineers recommend that navigation improvements at Hilo, Hawaii, be authorized for construction and maintenance in accordance with the plan described in the District Engineer's Report. The improvements include deepening the entrance channel to 39 feet and widening it to 440 feet, deepening the turning basin to 38 feet and relocating it to within 110 feet of the port facilities. The reporting officers estimate the first cost of their recommended plan to be $4,010,000, based on October 1984 price levels. Average annual charges, based on a 50-year period for economic analysis and an interest rate of 8-3/8 percent, are estimated at $356,000. Average annual benefits are estimated at $710,000, resulting in a benefit-cost ratio of 2.0.

3. The Board of Engineers for Rivers and Harbors concurs in the findings of the reporting officers and recommends the proposed modification subject to cost sharing and financing arrangements satisfactory to the President and the Congress.

4. The Board carefully considered the issue of a single user for the Hilo harbor. In reviewing the relevant information, the Board concluded that the port serves multiple users because the port facilities are open to

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public use and serve fourteen separate agricultural producers. I have reviewed the findings of the Board. After careful consideration of current information and policies, I concur with the findings of the Board.

5. Supplemental analyses incorporating the evaluation criteria emphasized by the Assistant Secretary of the Army (Civil Works) indicates that project justification is not significantly affected by vessel operating practices. There also will be no change in the project's scale, scope, or economic justification as the result of implementation of proposed cost recovery legislation.

6. The Administration's policy on water project financing and cost sharing is that all Federal water development agencies will continue to seek out new partnership arrangements with the States and other non-Federal interests in the financing and cost sharing of the proposed projects. Each such agency will negotiate reasonable financing arrangements for every project within its respective area of responsibility. In addition, prior commitment to individual States with regard to water development within their borders will be considered and shall be a factor in negotiations leading up to project construction; and, consistency in cost sharing for individual project purposes, with attendant equity, will be sought. Project beneficiaries, not necessarily governmental entities, should ultimately bear a substantial part of the cost of all project development.

7. It is noted that the recommended plan maximizes net economic benefits and is therefore designated the National Economic Development (NED) plan. Accordingly, I concur in the findings, conclusions and recommendations of the Board.

8. The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation funding.

E. R. HEIBERG III
Lieutenant General, USA
Chief of Engineers

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DEPARTMENT OF THE ARMY
BOARD OF ENGINEERS FOR RIVERS AND HARBORS
KINGMAN BUILDING
FORT BELVOIR, VIRGINIA 22060

REPLY TO
ATTENTION OF:

BERH-PLH

18 July 1983

SUBJECT: Hilo Harbor, Hawaii

Chief of Engineers
Department of the Army
Washington, DC 20314

Summary of Board Action

The Board finds that deep-draft navigation improvements for the existing Federal project at Hilo Harbor, Hawaii, are feasible. The reporting officers' plan includes dredging an entrance channel 440 feet wide and 2,200 feet long to a depth of 39 feet and a turning basin 1,400 feet by 1,800 feet to a depth of 38 feet. The first cost of the recommended plan is estimated at $3,661,000, and the benefit-cost ratio is 2.0. The Board recommends the plan subject to cost-sharing and financing arrangements satisfactory to the President and the Congress. The Board also notes that the recommended plan may be economically marginal using evaluation criteria recently emphasized by the Office, Assistant Secretary of the Army (Civil Works) for deep-draft navigation projects. Such criteria should be considered during future planning for the proposed Hilo Harbor project.

Summary of Report Under Review

1. Authority. This report is in partial response to Section 144 of the Water Resources Development Act of 1976. In this Act, the Secretary of the Army, acting through the Chief of Engineers, was authorized to study methods to develop, utilize, and conserve water and land resources in the Hilo Bay Area, Hawaii. This interim report presents results of investigations of the immediate and future needs for deep-draft navigation at Hilo, Hawaii. Section 144 is quoted in the District Engineer's Report. A final report in full response to the Act will be submitted later.

2. Description of the study area. The study area is located at Hilo on the Island of Hawaii, State of Hawaii. Hilo is the major business center of the Island. Its 1980 population was 42,320,

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and it is expected to grow at a relatively slow rate in the future. Hilo Harbor is the principal port-of-call on the Island for oceangoing vessels.

3. Economic development. Hilo Harbor is the larger of two commercial deep-draft ports located on the Island of Hawaii. Average annual cargo shipments at Hilo exceed 1,000,000 short tons. Principal imports include general cargo and petroleum products, while exports are primarily sugar and molasses. Sugar production is the leading agricultural commodity, and since 1965, sugar exports from Hilo Harbor have ranged between 197,605 and 288,893 short tons per year.

4. Existing improvements. The existing Federal deep-draft navigation project at Hilo consists of a rubblemound breakwater 10,080 feet long; an entrance channel 35 feet deep; and a turning basin 1,400 feet wide, 2,200 feet long, and 35 feet deep. A non-Federal mooring buoy, located within the turning basin, is used to hold vessels away from Pier 1 during storm surge conditions in the harbor. The buoy helps to reduce vessel damages, to avoid vessel delays during loading and unloading, and to prevent damage to dock facilities by vessels.

5. Needs. Two vessels now transporting sugar from the harbor have the capability of drafting 34 feet fully loaded, but are unable to do so because of inadequate depths. Deepening the harbor would give these vessels the capability to transport full loads, thereby decreasing transportation costs.

6. Improvements desired. Local interests desire a deeper harbor entrance channel and turning basin capable of accommodating the maximum draft of vessels using Hilo Harbor.

7. Alternatives considered. The reporting officers considered structural and nonstructural alternatives. Structural measures included various configurations of channel and turning basin boundaries and depths for navigation. Nonstructural measures included scheduling vessel movements to take advantage of high tides.

8. Plan of improvement. The District Engineer's selected plan of improvement consists of dredging an entrance channel 2,200 feet long, 440 feet wide, and 39 feet deep; and a turning basin 1,800 feet long, 1,400 feet wide, and 38 feet deep. The turning basin would be relocated eastwardly from its present site to within 110 feet of the State-owned Pier 1. Dredged material would be disposed of at an offshore ocean site designated by the Environmental Protection Agency.

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9. Economic evaluation. Based on October 1982 price levels, the District Engineer estimates the total first cost of his selected plan at $3,661,000, of which $311,000 would be non-Federal costs under traditional cost-sharing policies. Average annual charges, based on an interest rate of 7-7/8 percent and a 50-year period for economic analysis, are estimated at $307,000. Average annual benefits are estimated at $627,000, and the benefit-cost ratio is 2.0.

10. Environmental impacts. The selected plan would have no significant adverse environmental impacts. During initial dredging, there would be a temporary increase in turbidity in the harbor area. The deep ocean disposal of dredged material would also cause temporary increases in turbidity and nutrient levels at the disposal site. Bioassay studies prior to construction will determine the final method of dredged material disposal.

11. Project effects. Implementation of the District Engineer's selected plan would allow larger oceangoing vessels to use a greater portion of their total capacities, thereby resulting in more efficient ocean transport of cargo.

12. Recommendation of the reporting officers. The District Engineer recommends that the existing navigation project at Hilo Harbor be modified, generally in accordance with the plan described in his report and subject to certain cost-sharing and financing arrangements with local interests. The Division Engineer concurs.

Review by the Board of Engineers for Rivers and Harbors

13. General. The scope of the Board's review encompassed the overall technical, economic, social, environmental, and policy aspects involved in the improvement proposed by the reporting officers. The Board considered the report's conformance with essential elements of the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources. The study and report were examined to determine compliance with applicable administrative and legislative policies and guidelines and to assure that the general public has been afforded adequate opportunity for input and comment.

14. Responses to the Division Engineer's public notice. The Division Engineer issued a public notice on 26 February 1982 stating the recommendation of the reporting officers and inviting public comment to the Board. Two communications were received from one respondent expressing environmental concerns. These concerns were resolved through subsequent discussion and correspondence.

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15. Findings and conclusions. The Board of Engineers for Rivers and Harbors concurs generally in the views and recommendations of the reporting officers. The improvements are economically justified and technically sound, and the recommended plan maximizes net National Economic Development benefits.

16. The Board notes that one company would be the initial beneficiary of this proposed improvement, and considered the need to require special cost sharing. However, this company is organized as an agricultural cooperative association of 14 Hawaiian sugar plantation members involved in all agricultural and processing phases of the sugar industry. Federal and State laws, as a matter of public policy, encourage individual agricultural producers to form cooperatives for various purposes. In addition, the port facilities are publicly owned and open to any other users at some future date. Therefore, the Board believes the proposed modification does not warrant special cost sharing.

17. The Board was aware of a recent position taken by the Office, Assistant Secretary of the Army (Civil Works) emphasizing the importance of analyzing deep-draft navigation projects based on vessel underkeel clearances actually being observed or likely to occur in the study area under without-project conditions. The Board recognizes that the recommended plan may be economically marginal using this criteria. Therefore, during future planning for the proposed Hilo Harbor project, vessel loading characteristics at that time should be considered in determining potential savings in transportation costs and the economic merit of the project.

18. The Administration's position on deep-draft navigation cost sharing and financing is for substantial non-Federal sharing of operation, maintenance, and construction or rehabilitation costs for deep-draft channels and ports with authorized depths greater than 14 feet. While the details of the Administration's position have not been specified, preferences have been indicated for sharing construction costs on a port-by-port basis, and by recovering operation and maintenance costs through a uniform nationwide fee.

19. Recommendations. The Board recommends that improvements for commercial navigation at Hilo Harbor, Hawaii, be authorized for implementation generally in accordance with the plan of the reporting officers, with such modifications as in the discretion of the Chief of Engineers may be advisable, and subject to cost-sharing and financing arrangements satisfactory to the President and the Congress. The first cost to the United States, based on October 1982 price levels, is estimated at $3,350,000. This

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recommendation is made with the provision that, prior to implementation, non-Federal interests will, in addition to the general requirements of law for this type of project, agree to comply with the following requirements:

a. Provide without cost to the United States, all lands, easements, and rights-of-way required for construction and maintenance of the project and for aids to navigation upon request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for disposal of dredged material, including necessary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works;

b. Provide and maintain, without cost to the United States, adequate depths in berthing areas;

c. Provide and maintain, without cost to the United States, adequate public terminal and transfer facilities, open to all on equal terms;

d. Accomplish without cost to the United States such alterations and relocations as may be required for the construction works;

e. Hold and save the United States free from damages due to the construction works, not including damages due to the fault or negligence of the United States or its contractors; and

f. Prohibit erection of any structure within 110 feet of the bottom edge of any proposed channel or turning basin.

FOR THE BOARD:

WILLIAM E. READ
Major General, USA
Acting Chairman

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REPORT OF THE DISTRICT ENGINEER

SYLLABUS

This is a survey report of the feasibility of improving the existing Federal project at Hilo Harbor, Hawaii. The initial requests for this study were Resolutions 144 (1973) and 480 (1975) by the Hawaii County Council. In 1976, the US Congress authorized the study. The Honolulu Engineer District initiated the Hilo Area Comprehensive Study that year.

This report addresses the Deep-Draft Navigation component of the Comprehensive Study. Later reports will deal with Bay Water Quality; Small Craft Facilities; Shore Protection; Floodplain Management; Recreation and Fish and Wildlife; and Water Supply.

The existing Federal project, a 35-foot-deep harbor and a 10,080-foot-long breakwater, was completed in 1930. Since then, Hilo and the economy and population of the County of Hawaii (Hawaii Island) have grown considerably. Some improvements to Hilo Harbor are required to support the economy of Hawaii County.

The recommendations of this report are to deepen Hilo Harbor's entrance channel to 39 feet and turning basin to 38 feet to accommodate larger vessels. The total first cost of this project would be $3.7 million. Dredge material would be disposed of in deep ocean water. There are no significant adverse environmental or social effects from the implementation of this plan.

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AUTHORITY

The authority for this interim survey report is Section 144 of the Water Resources Development Act of 1976 (Public Law 94-587). Section 144 states:

> The Secretary of the Army, acting through the Chief of Engineers, in cooperation with the State of Hawaii and appropriate units of local government, shall make a study of methods to develop, utilize, and conserve water and land resources in the Hilo Bay Area, Hawaii, and Kailua-Kona, Hawaii. Such study shall include, but not be limited to, consideration of the need for flood protection, appropriate use of flood plain lands, navigation facilities, hydro-electric power generation, regional water supply and wastewater management facilities systems, recreational facilities, enhancement and conservation of water quality, enhancement and conservation of fish and wildlife, other measures for environmental enhancement, and economic and human resources development. Based upon the findings of such study, the Secretary of the Army, acting through the Chief of Engineers, shall prepare a plan for the implementation of such findings which shall be compatible with other comprehensive development plans prepared by local planning agencies and other interested Federal agencies.

PURPOSE AND SCOPE

This report presents a plan for the implementation of the study findings to develop, utilize and conserve deep-draft navigation facilities at Hilo, Hawaii (Figure 1). This is an interim survey report which addresses deep-draft navigation issues of the study authority, and is part of the Hilo Area Comprehensive Study. Other components of the Study will be reported later.

The use of an interim report on the Comprehensive Study permits early action on significant study findings pertaining to navigation needs. The recommendations in this report are consonant with study findings pertaining to Hilo Bay's water quality and biological resources.

The investigations described in this report encompass Hilo Harbor (Figure 2). Investigations were made of the immediate and future regional needs for expansion of deep-draft navigation facilities; measures or combinations thereof capable of satisfying such needs; the accompanying economic, environmental, and social considerations; and coordination with concerned agencies and the public. These studies provide the depth and detail required to determine plan feasibility.

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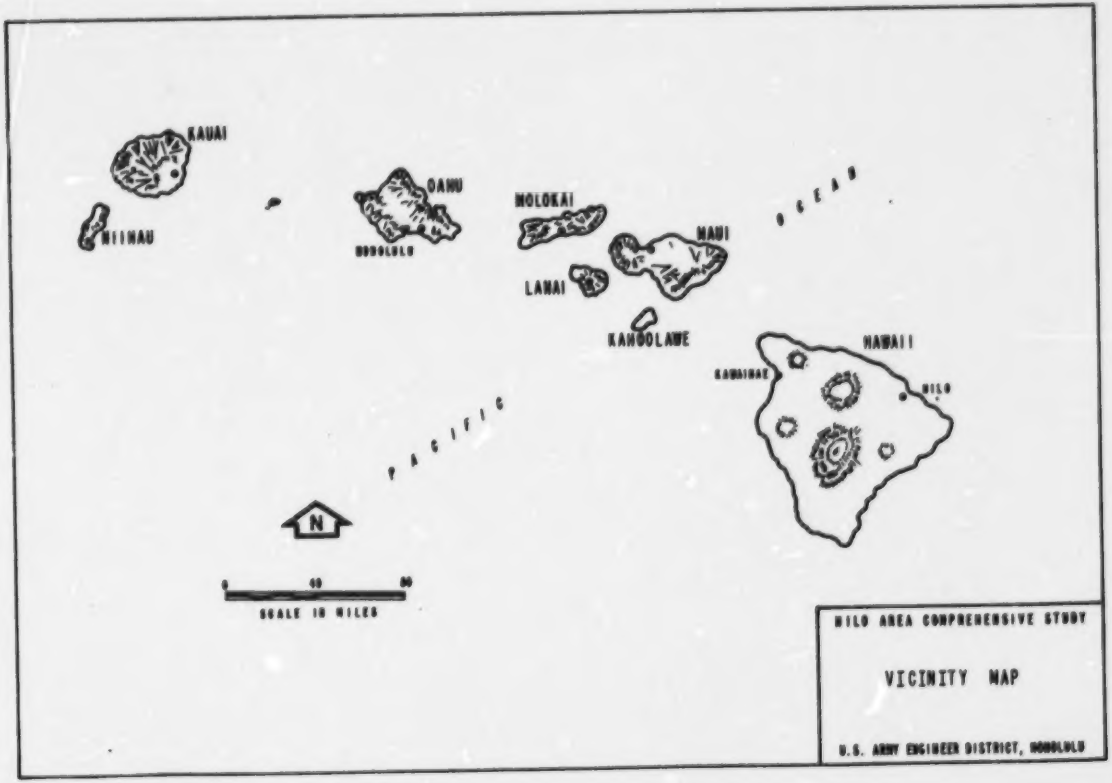

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After review and approval by the Board of Engineers for Rivers and Harbors, the final report of the Chief of Engineers will be forwarded to the Secretary of the Army. He will obtain the views of the Office of Management and Budget and transmit the report to the Congress. If the Congress concurs with the report's findings and authorizes the project, funds will be requested to perform advanced engineering and design work. After assurances of local cooperation are furnished, construction would be initiated.

This report is a decisionmaking document containing an Environmental Impact Statement. Supporting documentation including: engineering, design, and cost; and economics information is separately bound.

PRIOR STUDIES, REPORTS, AND EXISTING WATER PROJECTS

The existing deep-draft harbor at Hilo is an authorized project which includes a rubblemound breakwater 10,080 feet long; an entrance channel 35* feet deep; and a turning basin 1,400 feet wide, 2,300 feet long, and 35 feet deep. The project was authorized in the River and Harbor Acts of 2 March 1907, 25 July 1912, and 3 March 1925. The project was completed in July 1930. Sixty percent of the breakwater was seriously damaged during the 1946 tsunami and repairs were completed in 1948. Later breakwater repairs were completed in 1968, 1975 and 1981.

A tsunami protection project was authorized by the 1960 River and Harbor Act. A post-authorization study was completed in 1967. The study found that protective works at a cost of $60 million would be feasible. However, local government rejected the plan and its $10 million local cost-sharing requirement. The project was deauthorized in 1977.

A study to determine the feasibility of modifying Hilo Harbor to prevent surge was authorized by House Resolution 739 in 1967. The results were not fully conclusive but suggested that surge is correlated with short-period waves generated by North Pacific storms.

PLAN FORMULATION

Existing Conditions

Hilo is the primary commercial port of Hawaii County, an island of more than 4,000 square miles and 92,000 people. Most of the island's general cargo and petroleum inshipments and sugar and molasses outshipments pass through Hilo.

The cargo volume at the commercial port has averaged over 1 million tons annually for several years. An upward trend continues, but major increases in cargo throughput are not predicted unless significant changes to the existing economic situation develop, for example, establishment of a manganese processing industry. A passenger vessel recently began visiting Hilo and continued growth may be possible. Hilo Harbor (Figure 3) has a 35-foot project depth, which does not permit the largest capacity ships to enter or depart Hilo

*In this report, all depths are a mean lower low water datum.

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Harbor fully loaded. North Pacific winter storms cause surge in the commercial port that may prevent ships from loading or unloading up to 6 days a year. This condition results in delays and damages. Although water quality has improved in recent years, the bay experiences poor circulation due to the breakwater. High turbidity occurs during heavy rainstorms and as a consequence of runoff via the Wailuku and Wailoa rivers and storm drains.

The Corps of Engineers is responsible for the maintenance of the Federal project. About 50,000 cubic yards of sediment were dredged in 1977 from the turning basin. On the breakwater, a 700-foot section directly seaward of Pier 1 was reinforced in 1981 with tribars and covered with reinforced concrete ribs at a cost of about $2 million. Additional work is expected to be done during the next few years to repair the entire breakwater, which is over 50 years old and does not meet current design criteria.

Future Conditions (Without A Project)

Longer vessels with deeper drafts (and larger cargo capacities) will replace some vessels in the existing fleet. In the absence of dredging to deepen the entrance channel and turning basin, some vessels will not be able to operate fully loaded. Some vessels will have problems turning because of the less than optimum basin width. Surge-caused ship motion at the docks will delay vessels and cause damages to lines, fenders, piers, vessels, and injury to dock workers.

Problems and Opportunities

Hilo Harbor has four main problems: (1) ship motion at the piers; (2) insufficient depth to accommodate existing and projected vessels when they are fully loaded; (3) area of the turning basin and (4) quality of the bay's water.

Ship motion at the piers is caused by surging in the bay during wave attacks which originate in the North Pacific during winter storms. Vessels are prevented from loading or unloading on an average of 6 days per year primarily during the months of October through May. Less severe surge occurs more frequently and vessel operations may be slowed or cease for short periods. There are occasional damages to piers, fenders, lines, cargo, and vessels. The risk of injury to longshoremen is serious.

The existing project was designed for smaller vessels than are used today. The project depth of the entrance channel and turning basin is 35 feet. The required underkeel clearance in the turning basin is 5 feet and in the entrance channel, 6 feet, which leaves a vessel operating draft of about 30 feet. Vessels must operate light-loaded. In addition to being economically inefficient, energy and human resources are wasted. Presently, up to 0.8 feet of tide is used by departing, loaded sugar vessels to increase their operating drafts.

The project turning basin dimensions are 1,400 feet by 2,300 feet. This is adequate for vessels up to 700 feet in length. Since the longest projected vessel is estimated at 725 feet, this would not normally be a problem. However, a mooring buoy (used to hold vessels off Pier 1 during surging conditions) is located (Figure 3) about 900 feet west of Pier 1, 600 feet

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north of Pier 2, and about 600 feet north of the nearest turning basin boundary. Vessels with bow thrusters are able to manuever around the buoy; vessels without bow thrusters require the assistance of two tugs. This adds to operating costs, especially since the second tug has to come from Kawaihae a distance of about 100 nautical miles. The mooring buoy is in an optimum position to hold vessels off Pier 1 during surging. The buoy, installed in 1969, partly as a response by local authorities to District suggestions, has prevented damages to the pier. Delays have been reduced because the vessels at berth can put a line to the buoy and hold off of the pier by several feet using winches. This saves costs of tug assistance and vessel start up during many surging incidents.

The quality of the bay's water responds to two variables. One is the amount of rainfall, since the major cause of high turbidity in the bay is stormwater runoff from natural and agricultural lands. The urban portion of runoff from Hilo is less than 1 percent of the bay's adjacent watershed. The second water quality variable is circulation and flushing within the bay. Hilo Harbor's long (10,080 feet) breakwater restricts circulation and is a major cause of turbidity in the bay.

Objectives

The following objectives were established for the study:

a. As a contribution to deep-draft navigation, encourage the efficient development and utilization of Hilo Harbor to accommodate all waterborne commerce and associated traffic during the 1985-2035 period of analysis.

b. Contribute to the reduction of ship delays and damages caused by ship motion or natural wave action at the Hilo docks.

Constraints

Several constraints were identified prior to formulating alternative plans.

a. Surge induced ship motion at the piers, although a problem, does not have a major effect on transportation costs at Hilo Harbor. The average annual benefits related to surge reduction are relatively small. The small size of these benefits is a planning constraint for structural remedies. Less expensive nonstructural measures of surge reduction should be implemented.

b. The relatively poor quality of Hilo Harbor sediments poses a constraint on the method of dredge spoil disposal. Land disposal is an unlikely alternative because the spoil material does not have useful properties and there are no suitable lands nearby for marshland creation.

c. The area of the turning basin is adequate but the surge-mooring buoy is a constraint. The dilemma is that if the buoy is removed to take advantage of the full turning basin, surge-caused delays and damages will increase. Conversely, leaving the surge-mooring buoy in place will cause increases in vessel operating time and tug assist costs.

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Available Measures

The following measures are available to meet the planning objectives:

Nonstructural

Nonstructural measures include replacing the existing mooring buoy with a submersible mooring buoy, improving the existing dock fender system, installing pretensioning devices, managing vessel schedules more efficiently and developing new systems to meet the increased container storage needs.

Submersible Mooring Buoy. Persons knowledgeable of navigation and shipping conditions in Hilo Harbor agree that the buoy is invaluable during the winter months to settle ships, but at its present location, the existing mooring buoy interferes with large vessels turning in the basin. Without the buoy, ships would have to clear berth and move to an anchorage outside the harbor and perhaps not return to complete the loading operation during periods of severe surge.

A submersible buoy would solve this problem. This measure utilizes the existing anchors, ground chains, and ground ring. A buoyant tube, somewhat longer than the depth of water in the vicinity of the anchors, would be attached at one end to the ground ring. The other end of the tube would be fitted with buoyancy cells and provision for attaching ship lines. The tube serves as a tension rod link between the ship lines and existing anchors, as well as a boom which can be raised to expose the tip to which ship lines are attached. The tube and cells would be installed to not decrease project depths.

When anchorage is needed during surge conditions, high pressure air would be introduced into the air sacs in the cell and tube, displacing and thereby expelling water, such that the attachment tip of the tube is buoyed to the surface, much like a submarine surfaces upon blowing its tanks. The ship lines would then be secured to the top of the tube.

When no longer needed, the ship lines would be disconnected and the tube laid on the harbor bottom by releasing the air pressure, thereby collapsing the air sacs and flooding the tube. As a precautionary measure, hazard buoys would be placed about the tube location prior to raising the tube.

Improvements to Existing Fender System. Ship motions, as well as mooring downtime, can be reduced if breast lines of the ships are pretensioned. The steady force created by the cable pretension can hold the hull in contact with the fender system. Because of this effect, ship motions can be damped out by the friction force on the contact surface and the bumping force against the fender can partially be cancelled by the steady slide force. Monitoring the mooring lines tension and relative movement of the loading equipment is an available measure to reduce ship motion.

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If pretension devices (constant tension mooring winches) are used, the assumption is that two are installed at the bow and two installed at the aft of the design vessel. Pier 1 would be top priority for fender improvement. About 1,300 lineal feet are required. Both the pretension devices and the improved dock fender system are locally implementable. Many of the vessels using Hilo Harbor have the winches but they are not used because of the existing fender design.

Other Measures. To reduce the effect of surge, one measure is management of vessel schedules. The harbor master now manages schedules, but the randomness of surge events inevitably disrupts traffic. There is no early warning of surge and some vessels' schedules vary--particularly the double tow tug and barges from the west coast. Their arrival time is not predictable to the nearest day as in the case of the container ships. Therefore, more intense management of vessel schedules is not possible nor is this an available measure.

New systems could be developed to meet container storage needs. These include stacking of containers and better utilization of the open space on the piers. This measure could be studied further by the local government.

Structural

Structural measures applicable to deep-craft navigation are dredging of a deeper entrance channel and turning basin, dredging of a wider turning basin, constructing new piers and supporting facilities to accommodate the increasing number of vessels using Hilo Harbor, constructing a revetted fill area to store additional containers, and partially removing the existing breakwater and replacing it with a new inner breakwater.

Entrance Channel and Turning Basin. In order to accommodate the larger vessels using and projected to use Hilo Harbor, the entrance channel and turning basin must be dredged to provide 6 feet underkeel clearance in the entrance channel and 5 feet in the turning basin. The one-way entrance channel width of 450 feet and depth of 39.0 feet are required to insure safe and economic navigation.

The width of the turning basin is related to ship motion at Hilo docks. Minimization of ship motion would permit removal of the buoy which is now required for ships moored during severe surge conditions. This buoy interferes with vessels turning in the basin. Removing this buoy directly affects the amount of widening that must be done to the basin to make it adequate from an operational viewpoint. With the buoy, the harbor's turning basin should be widened by 400 feet, but without the buoy the widening would not be required.

All material to be dredged is clay and silt, and deep ocean disposal is less costly and is the preferred method of disposal. Based on a strict comparison of transport costs, land disposal is least expensive where the land disposal site is less than 4.5 miles from the dredge site. However, there are no publically acceptable sites. Ocean disposal would be made at an EPA-approved site.

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Additional Storage Area. Construction of a revetted fill area for additional container storage would require a quarry stone revetment to retain dredged material. The revetment would require quarry stones placed on a 1.5 horizontal to 1 vertical slope, a slope sufficiently flat to adequately dissipate wave energy. In addition, voids between stones would also provide dampening capacity to absorb wave energy, which if reflected back into the harbor, would adversely affect navigation. As a Federal project, construction of a revetted fill area is economically infeasible, but such a project could be implemented locally. It was evaluated if dredge spoil could be placed as fill. However, since the Hilo Harbor sediments are silts and clays, unsuited for fill, this alternative measure is not feasible.

Inner Harbor Protective Breakwater. This concept consists of two rubblemound breakwaters placed to reduce surge in the berthing area and would be a major structural addition to Hilo Harbor.

Development of Alternative Plans

Three preliminary plans were formulated using various combinations of the available measures shown in Table 1.

Description of Plans. Plans A (Figure 4) includes the construction of two rubblemound breakwaters (crest elevation 9.5 feet and 900 feet and 2100 feet long), an entrance channel 39 feet deep, 2200 feet long and 440 feet wide, and a turning basin 38 feet deep and 1800 feet long by 1400 feet wide.

Plan B (Figure 5), proposed by the Hawaii Island Chamber of Commerce, requires breakwater modifications, construction of new fill, roads and revetments for 100 acres of fast land. The entrance channel and turning basin would be deepened as in Plan A.

Plan C (Figure 6) includes the project deepening as in Plan A.

Screening of Alternatives

The three plans formulated in preliminary planning were carried forward for screening. The plans vary considerably in their costs, structural and nonstructural features, and environmental impacts. The plans are identified as follows:

Plan A - Inner Harbor Protective Breakwater and Deepening.

Plan B - Chamber of Commerce Plan.

Plan C - Harbor Deepening and Nonstructural Measures.

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The cost apportionment for each plan is based on current law and regulations. Revisions in cost apportionment policy are discussed in the section "PLAN IMPLEMENTATION."

TABLE 1. AVAILABLE MEASURES

Planning Objective	Management Measure	Planning Status
As a contribution to deep-draft navigation, encourage the efficient development & utilization of Hilo Harbor to accommodate all waterborne commerce and associated traffic during the 1985-2035 period of analysis.	Dredge a deeper entrance channel & turning basin.	Included in Plans A, B, C.
	Dredge a wider turning basin.	Submersible mooring buoy is more favorable.
	Remove existing mooring buoy & replace with submersible mooring buoy.	Locally implementable.
	Construct a revetted fill area to store additional containers.	Economically infeasible for Federal project. May be locally implementable.
	Stack containers on existing storage area.	Locally implementable.
	Adjust vessel schedules.	Locally implementable.
	Reduce time to tie-up and turn.	Locally implementable.
	Build new piers and supporting facilities.	Locally implementable.
Contribute to the reduction of ship delays and damages caused by ship motion or natural wave action at the Hilo docks.	Improve ship fender system.	Locally implementable.
	Manage vessel schedules more efficiently.	Currently implemented.
	Install pretension winches.	Partially implemented by local interests.
	Construct an inner breakwater to provide greater protection to the port.	Included in Plan A.

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PLAN A - INNER HARBOR PROTECTIVE BREAKWATERS AND DEEPENING

Description. This plan (Figure 4) requires construction of two rubblemound breakwaters to minimize wave energy entering the berthing areas. Deepening of the entrance channel to 39 feet and turning basin to 38 feet are also included in this plan. Table 2 shows the construction costs of this plan.

TABLE 2. PLAN A COSTS AND BENEFITS ($)

Project First Cost		$20,200,000
Engineering, Design, Supervision & Administration (E&D,S&A)		1,600,000
Interest During Construction (IDC) 24-month Construction Period		1,717,000
Total Investment Cost		$23,517,000
Interest & Amortization (.08057 or 7-7/8%) on the Total Investment Cost		1,895,000
Annual Operation & Maintenance (O&M) Cost		45,000
Total Average Annual Cost		$1,940,000
Average Annual Benefits		$ 791,000
Benefit-Cost Ratio		0.4
Net NED Benefits		NONE
COST APPORTIONMENT	NON-FEDERAL	FEDERAL
Project First Cost	$322,000	$19,878,000
E&D, S&A	50,000	1,550,000
IDC		1,717,000
Total Investment Cost	$372,000	$23,145,000
Average Annual Costs	$ 30,000	$ 1,910,000

Impact Assessment. Enclosing the inner harbor will reduce wave energy and mixing of the water layers and reduce water exchange with the outer harbor. There would be a decrease in bay water quality. Deepening will temporarily increase water turbidity.

Mitigation Requirements. None.

Implementation Responsibilities. The Corps would provide overall management for implementation and the State would be responsible for all local requirements.

Cost Allocation. None.

Public Views.

Federal Agencies. The USF&WS would prefer to improve, not decrease circulation in the harbor.

Non-Federal Agencies. No objections.

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PLAN B - CHAMBER OF COMMERCE PLAN

Description. This plan (Figure 5) requires extensive breakwater modifications, construction, dredging and filling. It would provide new land for harbor operations and additional piers. Table 3 displays the costs.

TABLE 3. PLAN B COSTS & BENEFITS ($)

Project First Cost		$116,911,000
Engineering, Design, Supervision & Administration (E&D,S&A)		7,115,000
Interest During Construction (IDC) 36-month Construction Period		14,651,000
Total Investment Cost		$138,677,000
Interest & Amortization (.08057 or 7-7/8%) on the Total Investment Cost		11,173,000
Annual Operation & Maintenance (O&M) Cost		44,000
Total Average Annual Cost		$11,217,000
Average Annual Benefits		$627,000
Benefit-Cost Ratio		0.1
Net NED Benefits		NONE
COST APPORTIONMENT	NON-FEDERAL	FEDERAL
Project First Cost	$72,904,000	$44,007,000
E&D, S&A	4,411,000	2,703,000
IDC		14,651,000
Total Investment Cost	$77,315,000	$61,361,000
Average Annual Costs	$6,229,000	$4,944,000

Impact Assessment. This plan would eliminate much of Blonde Reef, the most extensive coral habitat in Hilo Bay due to filling and dredging. Temporary impacts on water turbidity and sedimentation are anticipated. The historic Hilo breakwater would be realigned.

Mitigation Requirements. Mitigation could be required due to the loss of Blonde Reef.

Implementation Responsibilities. The Corps would provide overall management for implementation and the State would be responsible for all local requirements.

Cost Allocation. None.

Public Views.

Federal Agencies: The USF&WS opposes this plan.

Non-Federal Agencies: The Hilo Chamber of Commerce suggested and supports this plan.

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PLAN C - HARBOR DEEPENING AND NON STRUCTURAL MEASURES

Description. This plan (Figure 6) would deepen the entrance channel to 39 feet and the turning basin to 38 feet. Table 4 displays the construction and maintenance costs for Plan D.

TABLE 4. PLAN C COSTS & BENEFITS ($)

Project First Cost	$3,081,000
Engineering, Design, Supervision & Administration (E&D,S&A)	580,000
Interest During Construction (IDC) 12-month Construction Period	144,000
Total Investment Cost	$3,805,000
Interest & Amortization (.08057 or 7-7/8%) on the Total Investment Cost	$307,000
Annual Operation & Maintenance (O&M) Cost	-
Total Average Annual Cost	$307,000
Average Annual Benefits	$627,000
Benefit-Cost Ratio	2.0
Net NED Benefits	$320,000

COST APPORTIONMENT	NON-FEDERAL	FEDERAL
Project First Cost	$261,000	$2,820,000
E&D, S&A	50,000	530,000
IDC		144,000
Total Investment Cost	$311,000	$3,494,000
Average Annual Costs	$25,000	$282,000

Impact Assessment. There would be temporary impacts on water quality in the bay associated with dredging. No significant impacts due to construction of the mooring buoy anticipated. No effect on the historic Hilo breakwater is anticipated.

Mitigation Requirements. None.

Implementation Responsibilities. The Corps would provide overall management for implementation and the State would be responsible for all local requirements.

Cost Allocation. None.

Public Views.

Federal Agencies: This plan is acceptable to the USF&WS.

Non-Federal Agencies: This plan is acceptable to local agencies.

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EVALUATION OF FINAL PLANS

PLAN A - INNER HARBOR PROTECTION (Figure 4). This plan has a benefit-to-cost ratio less than unity (BCR = 0.4). It should reduce surge. It would worsen the environmental conditions in inner Hilo Harbor. Deepening is included so that deeper draft vessels could be accommodated.

PLAN B - CHAMBER OF COMMERCE PLAN (Figure 5). This plan has a benefit-to-cost ratio less than unity (BCR = 0.1). The plan would have significant negative impacts on the natural marine environment. Deeper draft vessels would be accommodated. The plan would provide benefits to local interests because of the opportunities for growth.

PLAN C - HARBOR DEEPENING AND NONSTRUCTURAL MEASURES (Figure 6). This plan has a benefit-to-cost ratio greater than unity (BCR = 2.0). Deeper draft vessels would be accommodated through dredging.

Table 5 shows a breakdown of the benefits attributed to each of the three plans. The computations are based on a 7-7/8 percent interest rate and a 50-year project life. The project base year 1985 is when benefits are expected to begin accruing.

TABLE 5. COMPARISON OF AVERAGE ANNUAL BENEFITS ($)

Benefit	Plan A	Plan B	Plan C
Increased Channel Depth	$627,000	$627,000	$627,000
Savings in Delays and Damages	164,000	-	-
TOTAL AVERAGE ANNUAL BENEFITS	$791,000	$627,000	$627,000

Costs for construction were estimated at October 1982 price levels. Table 6 shows summary of costs and benefits for the four alternative plans.

TABLE 6. SUMMARY OF COSTS AND BENEFITS ($)

	Plan A	Plan B	Plan C
Total Investment Cost	$23,517,000	$138,677,000	$3,805,000
Federal Share	23,145,000	61,361,000	3,494,000
Non-Federal Share	372,000	77,315,000	311,000
Average Annual Costs	1,940,000	11,217,000	307,000
Average Annual Benefits	791,000	627,000	627,000
Net Annual NED Benefits	NONE	NONE	320,000
Benefit-Cost Ratio	0.4	0.1	2.0

Rationale for Designation of NED Plan

Plan C has the greatest net benefits. It is the NED Plan.

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TRADE-OFF ANALYSIS

Plans A and B make net deductions from the national economic development (NED) account. Plan C makes net contributions to NED.

Plans A and B were dropped from further consideration because of their lack of positive contributions to national goals.

The System of Accounts (Table 7) displays and compares the costs, benefits and impacts of each plan.

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TABLE 7. SYSTEMS OF ACCOUNTS

		WITH CONDITION		
	Without Condition	PLAN A Inner Harbor Protection	PLAN B Chamber of Commerce Plan	PLAN C Harbor Deepening
A. PLAN DESCRIPTION				
	Repair & maintain: 10,080-foot breakwater. 35-foot project depth.	Dredge entrance channel to 39 feet and turning basin to 38 feet. Maintain existing 10,080-foot breakwater.	Same.	Same.
			Major modification of existing 10,080-foot breakwater to include bridge, access road to new harbor areas.	Maintain existing 10,080-foot breakwater.
		Construct 2 inner breakwaters 900 feet and 2,100 feet.	Construct revetted fills.	
B. IMPACT ASSESSMENT				
1. Social Well-Being.				
	Hilo Breakwater historic site.	Adds 2 breakwaters to the view. No adverse effect. (1, 6, 9)	Breakwater realigned as part of the project. No adverse effect. (1, 6, 9)	No effect.

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TABLE 7. SYSTEMS OF ACCOUNTS (Cont)

		WITH CONDITION		
	Without Condition	PLAN A Inner Harbor Protection	PLAN B Chamber of Commerce Plan	PLAN C Harbor Deepening
2. Environmental.				
a. Marine Environment.	Silt stressed Blonde Reef, silty harbor bottom.	80 acres of silty bottom disturbed. (1, 6, 9)	80 acres of silty bottom habitat disturbed. (1, 6, 9)	80 acres of silty bottom habitat disturbed. (1, 6, 9)
		Maintenance dredging cycle increased from 10 to 15 years.		Maintenance dredging cycle increased from 10 to 15 years.
		6 acres reef habitat covered. (1, 6, 9)	240 acres of marine habitat destroyed by fill and dredging. (1, 6, 9)	
		4 acres of rocky intertidal habitat created. (1, 6, 9)	7 acres of rocky intertidal habitat created. (1, 6, 9)	
b. Terrestrial Environment.	Developed park, commercial, industrial area.	No effect.	Increased land for industrial; commercial development; 100 acres (1, 6, 9)	No effect.
c. Water Quality Degraded.	Reduced flushing, circulation, water exchange. Low mixing, riverine discharges, high turbidity and siltation.	Temporary turbidity; 90 days. (1, 6, 9)	Temporary turbidity; 90 days. (1, 6, 9)	Temporary turbidity; 90 days. (1, 6, 9)
	Existing ocean disposal site	551,000 CY ocean disposal. (1, 4, 9)	551,000 CY ocean disposal. (1, 4, 9)	551,000 CY ocean disposal. (1, 4, 9)
		No long-term water quality change.	No long-term water quality change, although greater potential for trash pollutants.	No long-term water quality change.

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TABLE 7. SYSTEMS OF ACCOUNTS (Cont)

	WITH CONDITION			
	Without Condition	PLAN A Inner Harbor Protection	PLAN B Chamber of Commerce Plan	PLAN C Harbor Deepening
C. PLAN EVALUATION				
1. Contributions to Planning Objectives.				
a. Provide for deeper draft and larger vessels of the existing and future fleets.	No	Yes	Yes	Yes
b. Reduce delays & damages caused by ship motion or "surge" at the Hilo docks.	No	Yes	No	No
2. Response to Formulation Criteria.				
a. Provide a project with a benefit-to-cost ratio of 1.		No	No	Yes
b. Enhance, preserve or minimize effects on marine & terrestrial resources.		No	No	Yes

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TABLE 7. SYSTEMS OF ACCOUNTS (Cont)

	Without Condition	WITH CONDITION PLAN A Inner Harbor Protection	PLAN B Chamber of Commerce Plan	PLAN C Harbor Deepening
C. PLAN EVALUATION: (cont)				
3. Relationship to National Accounts.				
a. National economic development (NED):				
Avg annual benefits	NA	$ 791,000	$ 627,000	$ 627,000
Avg annual cost	NA	$1,940,000	$11,217,000	$ 307,000
Net annual benefits	NA	NONE	NONE	$ 320,000
Benefit to cost ratio	NA	0.4	0.1	2.0
b. Environmental quality (EQ).		No	No, maximum loss of marine environment.	Yes, least amount of environmental change.
c. Regional Development (RD).		No effect.	Possible increased local development.	No effect.
d. Other Social.	Economic urban growth same as projected by state and county.	No effect.	No effect.	No effect.
4. Responses to Associated Evaluation Criteria.				
a. Acceptability.	NA	Acceptable.	Unacceptable to USF&WS. some Hilo public.	Acceptable.
b. Completeness.	NA	Incomplete.	Incomplete.	Complete.
c. Effectiveness.	NA	Ineffective.	Ineffective.	Effective.
d. Efficiency.	NA	Inefficient.	Inefficient.	Very efficient.

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TABLE 7. SYSTEMS OF ACCOUNTS (Cont)

	Without Condition	WITH CONDITION PLAN A Inner Harbor Protection	PLAN B Chamber of Commerce Plan	PLAN C Harbor Deepening
D. IMPLEMENTATION RESPONSIBILITIES				
1. Corps of Engineers.	NA	Construct breakwater and dredge.	Dredge.	Dredge.
2. State of Hawaii.	NA	No new requirements. O&M requirements.	Construct new piers, roads, bridge.	Dredge berthing areas.
3. U.S. Coast Guard.	NA	Additional navigational aids are required.	Additional navigational aids are required.	Relocation of channel & basin buoys required.

INDEX OF FOOTNOTES:

TIMING
1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 5 years following plan implementation.
3. Impact is expected in a longer timeframe (15 or more years following implementation).

UNCERTAINTY
4. The uncertainty associated with impact is 50 percent or more.
5. The uncertainty is between 10 percent and 50 percent.
6. The uncertainty is less than 10 percent.

EXCLUSIVITY
7. Overlapping entry: Fully monetized in NED account.
8. Overlapping entry: Not fully monetized in NED account.

ACTUALITY
9. Impact will occur with implementation.
10. Impact will occur only when specific additional actions are carried out during implementation.
11. Impact will not occur because necessary additional actions are lacking.
(*) Item specifically required in Section 122, Public Law 91-611 and ER 1195-2-240.

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PLAN SELECTION

Plan C was selected as the final plan because of its low cost, ease of implementation and overall contribution to national objectives. The depth of dredging was based on the sensitivity analysis shown in Table 8.

Plan C does not have a significant effect on water quality. In public testimony and review comments, the general public and government agencies expressed favor for plans which would improve water quality. The Comprehensive Study is evaluating recommendations for improvement in water quality.

TABLE 8. SENSITIVITY ANALYSIS: INCREASED DEPTH

Depth (ft) (Basin/Channel)	Average Annual Cost ($)	Average Annual Benefit ($)	BCR	Net NED Benefits ($)	Total Investment Cost
36/37	201,000	246,000	1.2	45,000	2,497,000
37/38	249,000	438,000	1.8	189,000	3,090,000
38/39	307,000	627,000	2.0	320,000	3,805,000

SELECTED PLAN DESCRIPTION

Components

The selected plan includes the following components:

a. Deepening the entrance channel to 39 feet and the turning basin to 38 feet (Figure 6). This will provide for a vessel of 33-foot draft at MLLW and a 34-foot draft with a tide of 1.0 feet.

b. Local interests will continue their current management practices of special scheduling and handling measures during surge conditions.

Plan C's harbor lines are slightly modified from the existing project (Figure 3).

Dredge material would be disposed at an ocean site about 5 miles from Hilo. This site was approved by the U.S. Environmental Protection Agency in 1981.

Design and Construction

Design work can be accomplished in less than one year as can construction. Due to the simplicity of the selected plan, no problems are anticipated.

Operation and Maintenance

Maintenance would require about 50,000 cubic yards every 15 years to be dredged and disposed. This is the same volume as the existing project because there is no increase in the area of the project. Increases in volumes over existing conditions are not anticipated because sedimentation in the project is at a slow rate and there are no sediment sources directly to the harbor basin.

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Accomplishments

The selected Plan C provides for more efficient ocean transport of cargo to and from the island of Hawaii and Hilo, its population and commercial center. Deeper draft and more fully loaded vessels would be accommodated by deepening the project.

The selected plan is in compliance with Engineer Pamphlet 1165-2-1, Section 5 in that there will be no shoreline impacts on river mouths or inlets due to the implementation of the recommended Plan C.

Summary of Economic, Environmental and Other Social Effects

SELECTED PLAN (PLAN C)

Economics

Project First Cost	$3,081,000
Engineering, Design, Supervision and Construction	580,000
TOTAL PROJECT FIRST COST	$3,661,000
Federal Share	$3,350,000
Non-Federal Share	$311,000

The average annual cost of the Federal share is $270,000 at an interest rate of 7-7/8% for a 50-year project life. Costs and benefits are at October 1982 price levels. The benefit-cost ratio is 2.0.

Environment

- Temporary turbidity during dredging.
- The harbor may have higher water quality once polluted sediments are removed.
- No significant long-term effects or changes.

Social

- Long-term benefits to the community by helping to keep lowest possible freight rates.
- No significant changes.

Table 10 follows with specific Water Resources Council designated information.

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TABLE 9. EFFECTS OF THE RECOMMENDED PLAN ON RESOURCES OF PRINCIPAL NATIONAL RECOGNITION

Types of Resources	Principal Sources of National Recognition	Measurement of Effect
Air quality.	Clean Air Act.	No effect.
Areas of particular concern within the coastal zone.	Coastal Zone Management Act.	No effect.
Fish and wildlife habitat.	Fish and Wildlife Coordination Act.	No effect.
Endangered and threatened species critical habitat.	Endangered Species Act.	Resource not present in the planning area.
Floodplains.	E.O. 11988, Floodplain Management.	No effect.
Historic & cultural properties.	National Historic Preservation Act.	No effect.
Prime and unique farmland.	CEQ Memorandum of Aug 1, 1980, Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act.	Resource not present in the planning area.
Water quality.	Clean Water Act.	No effect.
Wetlands.	E.O. 11990, Protection of Wetlands, Clean Water Act of 1977.	No effect.
Wild and scenic rivers.	Wild and Scenic Rivers Act.	Resource not present in the planning area.

IMPLEMENTATION

Institutional Requirements

Following authorization by Congress, the Honolulu Engineer District would perform final preconstruction engineering and design work. The District would administer construction. The Division of Harbors, Department of Transportation, State of Hawaii is the local sponsor and responsible administrator for operation of Hilo Harbor.

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Federal and Non-Federal Responsibilities

Under current regulations, the local share of the project requires dredging (estimated cost: $311,000) of the berthing area next to Pier 1. However, under proposals recently made by the Federal government, all Federal costs of this project would be reimbursed by the local government. This issue would be resolved prior to implementation of the project. The items of local cooperation have been discussed with the sponsor.

Upon completion of construction of the recommended plan, the new project boundary lines will take effect and the Federal government will no longer maintain areas outside those lines. See Figures 3 and 6 for the comparative boundaries.

Views of the Sponsor

The sponsor approves of the plan and has submitted a letter of intent (Figure 7).

SUMMARY OF COORDINATION, PUBLIC VIEWS AND COMMENTS

In August 1981, the District circulated the Draft Navigation Report and Draft Environmental Impact Statement for public review and comment. The report included small-craft facilities as well as deep-draft facilities. This current report has carried forward only the deep-draft portions and the small-craft facilities will be the topic of a separate report at a later date.

Public and agency comments on the deep-draft planning have found the selected plan (Plan C) acceptable. However, the public and agencies have expressed a need for improved water quality in Hilo Bay. For this reason, as noted in the previous section "PLAN FORMULATION: Selection of the Final Plan," a measure to improve water quality will be discussed in a later report of the Comprehensive Study. This report incorporates comments made at a public meeting in Hilo on 17 September 1981.

RECOMMENDATIONS

I recommend that the plan of navigation improvements in the Hilo Harbor area herein indicated as Plan C be authorized for construction with such modifications as in the discretion of the Chief of Engineers may be advisable, at a first cost to the United States of $3,350,000 and an average annual first cost of $270,000. Since the administration is reviewing project cost sharing and financing across the entire spectrum of water resource development functions and has submitted proposed legislation to Congress, I recommend project authorization subject to cost sharing and financing arrangements which are satisfactory to the President and Congress.

a. Provide without cost to the United States, all lands, easements, and rights-of-way required for construction and maintenance of the project and for aids to navigation upon request fo the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for disposal of dredged material;

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

January 7, 1982 HAR-EP 2347

12 JAN 1982

CDR
DCE
AL

LTC Kenneth E. Sprague
District Engineer
U. S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858

Dear Colonel Sprague:

Hilo Deep-Draft Harbor

In response to your letter of November 10, 1981, the State of Hawaii, under existing laws, agrees to the following if the United States Congress authorizes construction of the recommended improvements to Hilo Harbor as described in your draft report of August, 1981:

1. Provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction and subsequent maintenance of the project.

2. Provide and maintain without cost to the United States adequate public terminal and transfer facilities open to all on equal terms.

3. Maintain regulations prohibiting discharge of untreated sewage, garbage, industrial waste, and other pollutants into the water of the harbor by users, thereof, which regulations shall be in accordance with applicable laws of Federal, State, and local authorities responsible for pollution prevention and control.

4. Hold and save the United States free from damages due to the construction work other than damages due to fault or negligence of the United States or its contractors.

5. Provide and maintain, without cost to the United States, depth in berthing areas and local access channels servicing the terminals commensurate with the depths to be provided as proposed in the selected plan.

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The State is fully cognizant of pending federal legislation which would require local sponsors to reimburse the Federal Government for expenditure by the U. S. Army Corps of Engineers for the construction of the navigational improvements as proposed in the selected plan. Should such legislation be adopted, we intend to evaluate the implications at the appropriate time to determine the extent to which the State can participate in the development of the project.

The proposal to deepen Hilo Harbor's turning basin will require investigating whether the existing pier can tolerate a corresponding deepening in the adjacent State's berthing area without compromising the integrity of the pier structure. We feel it would be advantageous to both our agencies if such an analysis was conducted during this early preliminary feasibility study stage.

We understand that this letter expresses the intent of the State of Hawaii and in no way legally binds us to the above agreement.

Very truly yours,

Ryokichi Higashionna

Ryokichi Higashionna
Director of Transportation

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b. Provide and maintain, without cost to the United States, berthing areas with a width of not less than 110 feet measured and a depth commensurate to the adjacent channel or turning basin depth;

c. Provide and maintain, without cost to the United States, adequate additional public terminal transfer facilities, and public access to the harbor, open to all on equal terms;

d. Accomplish, without cost to the United States, such alterations and relocations as may be required for the construction works and relocation assistance and payments in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646;

e. Hold and save the United States free from damages due to the construction works, excluding damages due to the fault or negligence of the United States or its contractors;

f. Prohibit erection of any structure within 110 feet of the bottom edge of any proposed channel or turning basin;

DATE: 83 July 12

ALFRED J. THIEDE
Colonel, Corps of Engineers
District Engineer

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[First endorsement]

PODED-P (Jan 82)
SUBJECT: Hilo Harbor, Hawaii, Deep Draft Navigation Improvements

DA, Pacific Ocean Division, Corps of Engineers, Building 230, Fort Shafter, HI 96858 26 February 1982

TO Chief of Engineers, Department of the Army, Washington, DC 20314

I concur in the views and recommendations of the District Engineer.

ALFRED J. THIEDE
Colonel, Corps of Engineers
Commanding

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FINAL
ENVIRONMENTAL IMPACT STATEMENT
DEEP DRAFT NAVIGATION IMPROVEMENTS IN HILO HARBOR
HILO AREA COMPREHENSIVE STUDY

The responsible State lead agency is the State of Hawaii, Department of Transportation, Harbors Division.

The responsible Federal lead agency is the US Army Corps of Engineers, and the cooperating Federal agency is the US Fish and Wildlife Service.

Abstract. Deep draft vessels operating in Hilo Harbor are hampered by insufficient water depth, surge (ship motion) during berthing, and lack of bertning and container space. The Corps has considered three plans to resolve problems and operational inefficiency in the harbor. Plan C, which involves deepening the harbor channel and basin, was found to resolve the problems with the least construction cost and the least modification to the existing harbor. Thus, the plan was designated the National Economic Development Plan, and was selected for implementation. Plan C does not involve the discharge of dredged or fill material under Section 404 of the Clean Water Act.

Bioassay and bioaccumulation tests and approval from the US Environmental Protection Agency are required before ocean dumping of the dredged material from Hilo Harbor can be implemented. If ocean disposal of dredged material is disapproved, other methods of dredged material disposal will have to be reevaluated.

SEND YOUR COMMENTS TO THE DISTRICT ENGINEER BY _____.

If you would like further information on this statement, contact:

James E. Maragos, PhD
Chief, Environmental Resources Section
US Army Corps of Engineers
Building 230
Fort Shafter, HI 96858
Phone: (808) 438-2263

NOTE 1: The information, displays, etc., in the main report are incorporated by reference into the EIS.

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1. SUMMARY

1.1 MAJOR CONCLUSIONS AND FINDINGS. Three plans were evaluated in the Hilo Area Comprehensive Study, Deep Draft Navigation Improvements Study. These plans included Plan A--Improving the Inner Harbor, Plan B--Chamber of Commerce Plan, and Plan C--Harbor Deepening.

TABLE 1. PLAN FEATURES

Plan A	Deepen the harbor from -35 feet to -39/38 feet MLLW; ocean disposal of dredged material. Construct two new breakwaters.
Plan B	Realign existing breakwater. Enlarge channel and turning basin; use dredged material for fill. Create fill areas behind breakwater.
Plan C	Deepen the harbor from -35 feet to -39/38 feet MLLW; ocean disposal of dredged material.

Plan C is designated the National Economic Development Plan since it costs the least to implement, and resolves navigational problems in the harbor. Plan C is the Environmental Quality Plan since modification of the breakwater would enhance recolonization of Blonde Reef, would improve water quality while possibly reducing erosion along Bayfront Beach, and would increase the number of surfing sites in the bay.

No wetlands or flood plains are involved. Bioassay and bioaccumulation tests and approval from the US Environmental Protection Agency are required before ocean disposal can be implemented. The effects of the discharge of dredged and fill material were evaluated under Section 404(b)(1). Plan C does not involve the discharge of dredged or fill material. Plans A and B involve the discharge of dredged or fill material on Blonde Reef. The discharges are prohibited under Section 404(b)(1) evaluation since Plan C is an available, practicable alternative. The U.S. Fish and Wildlife Service prefers Plan C. Hilo breakwater is eligible for inclusion to the National Register of Historic Places. Plan C was determined to have no effect on the historic breakwater. However, Plans A and B do affect the visual elements of the breakwater. No prime agricultural lands are located within the project area. Because of its low cost, least environmental change, and non-structural design, Plan C is selected as the plan to be implemented.

1.2 AREAS OF CONTROVERSY. None.

1.3 UNRESOLVED ISSUES.

a. Ocean Dumping. The requirements for bioassay and bioaccumulation testing and US Environmental Protection Agency approval need to be completed prior to discharge of the dredged material at the ocean dump site. If the Environmental Protection Agency disapproves the ocean disposal of the dredged material, other methods of disposal will have to be evaluated.

1.4 RELATIONSHIP TO ENVIRONMENT REQUIREMENTS: (See Table 2).

1.5 ADOPTION OF AN EIS. The probable environmental impacts of ocean disposal of the dredged material at the disposal site are discussed in the US Army Corps of Engineers, "Final Environmental Impact Statement for Maintenance Dredging in the State of Hawaii," 1975, and the US Environmental Protection Agency, "Final Environmental Impact Statement for Hawaii Dredged Material Disposal Sites Designation," 1980, and are adopted for the purposes of this statement. The results of the bioassay and bioaccumulation tests will be documented in a supplement to this environmental impact statement.

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TABLE 2. RELATIONSHIP OF THE PLANS TO ENVIRONMENT PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS

Federal Statutes	Plan A	Plan B	Plan C
Archaeological Resources Protection Act	Full	Full	Full
Clean Air Act	Full	Full	Full
Clean Water Act (See Section 6.2)	Partial	Noncompliance	N/A
Coastal Zone Management Act (See Section 6.2)	Partial	Partial	Full
Endangered Species Act (See Section 6.2)	Partial	Partial	Full
Estuaries Protection Act	N/A	N/A	N/A
Federal Water Project Recreation Act	Full	Full	Full
Fish and Wildlife Coordination Act	Full	Full	Full
Land and Water Conservation Act	N/A	N/A	N/A
Marine Protection, Research and Sanctuaries Act (See Section 6.2)	Partial	N/A	Partial
National Historic Preservation Act	Full	Full	Full
National Environmental Policy Act	Full	Full	Full
Rivers and Harbors Act	N/A	N/A	N/A
Watershed Protection and Flood Prevention Act	N/A	N/A	N/A
Wild and Scenic Rivers Act	N/A	N/A	N/A
Executive Orders, Memoranda			
Flood Plain Management	N/A	N/A	N/A
Protection of Wetlands	N/A	N/A	N/A

TABLE 2. RELATIONSHIP OF THE PLANS TO ENVIRONMENT PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS (CONT)

Executive Orders, Memoranda (Cont)	Plan A	Plan B	Plan C
Environmental Effects Abroad of Major Federal Actions	N/A	N/A	N/A
Analysis of Impacts on Prime and Unique Farmlands	N/A	N/A	N/A
State and Local Policies			
State NEPA (See Section 6.2)	Partial	Partial	Partial
State Coastal Zone Management Program (See Section 6.2)	Partial	Partial	Partial
County Special Management Area Permit (See Section 6.2)	Noncompliance	Noncompliance	Noncompliance
State Conservation District Use Application Permit (See Section 6.2)	Noncompliance	Noncompliance	Noncompliance
County General Plan	Full	Full	Full
State Land Use Plan	Full	Full	Full
Required Federal Entitlements (Permits)			
Non required			

NOTES: a. Full (Full Compliance). Having met all requirements of the statute, Executive Order or other environmental requirements for the current stage of planning (either pre- or post-authorization).

b. Partial (Partial Compliance). Not having met some of the requirements that normally are met in the current stage of planning. Partial compliance entries should be explained in appropriate places in the report and/or EIS and referenced in the table.

c. Non-Compliance. Violation of a requirement of the Statute, Executive Order, or other environmental requirement. Non-compliance entries should be explained in appropriate places in the report and/or EIS and referenced in the table.

d. N/A (Not applicable). No requirements for the statute, Executive Order or other environmental requirement for the current stage of planning.

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2. NEED FOR AND OBJECTIVES OF THE ACTION.

2.1 STUDY AUTHORITY. The study of Deep Draft Harbor Navigation Improvements in Hilo Harbor is conducted under Section 144 of the Water Resources Development Act of 1976. The Act authorizes a study of methods to develop, utilize and conserve water and land resources in the Hilo Bay area, including the consideration of the need for navigation facilities, for enhancement and conservation of water quality and, fish and wildlife, for environmental enhancement and for economic and human resources development. The recommendations shall be compatible with other local comprehensive development plans and plans of other interested Federal agencies.

2.2 PUBLIC CONCERNS.

a. The State of Hawaii, Department of Transportation, requested the assistance of the Honolulu District, US Army Corps of Engineers, to find methods of improving vessel operating efficiency in Hilo Harbor and of reducing damages due to ship motion. Some of the vessels presently using Hilo Harbor and of many of the projected future vessels cannot operate fully loaded in the existing harbor due to limiting water depths in the channel and turning basin. One of the vessels which regularly calls at Hilo has trouble turning in the basin because of the basin's limiting size. The turning basin is further restricted by a mooring buoy located in the middle of the turning basin. However, the buoy is used to safely berth vessels when ship motion alongside the dock becomes severe. The turning basin is also restricted when berthing space is overcrowded and vessels have to moor in the turning basin. The restriction in the turning basin delays ship or barge turnaround time, increases the chances for accidents, and requires the use of extra tugs. Ship motion is a major concern to vessel operators, port officials, and local businesses since the problem prevents vessels from unloading in Hilo, and causes damages to both vessels and wharves.

b. Local residences and agencies have expressed a need to improve water quality in Hilo Bay. The turbid waters and accumulated vegetative trash on the bayfront beach reduce recreational aesthetics and discourages water contact recreation. Fishermen complain of low recreational catches, and commercial fishing in the bay has declined. The bay is presently recovering from 75 years of sewage and industrial discharges, but contaminants are still present in the harbor sediments. Hilo Harbor breakwater reduces water exchange and circulation in the bay, induces heavy sedimentation which eliminates hard bottom habitat, and creates a two-layered water body by trapping freshwater discharged into the bay by springs and rivers. Local residents do not wish to see tsunami hazards aggravated and believe that the breakwater provided some protection from past tsunamis.

2.3 PLANNING OBJECTIVES.

a. Provide adequate improvements in the harbor and facilities to accommodate deeper draft and longer vessels of the existing and future fleets.

b. Improve water quality, fish habitat, and water-contact recreation in Hilo Bay through modifications of the breakwater.

c. Prevent any aggravation of tsunami hazards in Hilo Bay.

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3. ALTERNATIVES, INCLUDING THE PROPOSED ACTION.

3.1 PLANS ELIMINATED FROM FURTHER STUDY.

a. Widening the turning basin. Plans to widen the basin by dredging were eliminated because the plans considered in detail provided solutions to problems in Hilo Bay without dredging a wider turning basin.

b. Scheduling vessel arrivals. This alternative is a management action implemented by the local government to reduce delays related to surge and to efficiently utilize existing berthing and container storage space. The alternative was not considered in detail because scheduling control has been effectively implemented by local port authorities.

c. Removing the mooring buoy. The mooring buoy which is presently located in the turning basin is used to prevent ship and wharf damage during periods of strong surge, which slams ships against the wharf. While removing the buoy can open up the turning basin to ship traffic, the action does not eliminate navigation problems associated with limiting water depths and the lack of mooring space which forces ships to moor in the turning basin. The construction of a submersible mooring buoy, which can be raised and lowered when needed, would improve the situation. The local government could improve the wharf fender and mooring system in an effort to reduce surge damages. Such improvements could involve replacement of the wooden fender system with cylindrical rubber fenders and the installation and use of pretensioning winches to handle mooring lines to dampen ship motion next to the wharf. These actions could be implemented by the local government in conjunction with Federal efforts to deepen the turning basin.

d. Modifying the breakwater. The Draft Navigation Improvement Report and DEIS contained an alternative involving the deauthorization of the outer 7,500 feet of the existing breakwater and construction of a new 2,000-foot breakwater to protect the harbor. This alternative has been eliminated from this report and is being submitted as a separate study.

3.2 WITHOUT CONDITION (NO ACTION). Radical changes in cargo composition and tonnage traffic are not anticipated, but tonnage is expected to increase in relation to demands resulting from the continued growth of Hawaii County's population. The limitations in harbor depth (29 feet Controlling depth) and the lack of berthing and cargo storage space will continue the harbor inefficiency. Barge traffic volume is expected to remain unchanged, but a deeper draft integrated tug and barge (36 feet draft) is expected to be put into service. Two petroleum tankers with 36 feet design draft presently must underload to operate in Hilo Harbor and will continue to do so in the near future. Existing and future bulk carrier vessels have design drafts greater than 30 feet and will continue operating in Hilo Harbor. The State plans to expand the berthing area in Hilo Harbor along Baker's Beach, which will provide more container storage space, and to align the berthing area, to minimize present surge problems. No change in existing water quality parameters or water-contact recreation problems is anticipated.

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3.3 PLANS CONSIDERED IN DETAIL. Three plans were considered in detail for improvements to Hilo Harbor. Plan C, Harbor Deepening is designated the National Economic Development Plan because it has the least construction cost for implementation in comparison to the other plans. Plan C also involves the least amount of energy to implement due to its low construction cost and lack of major structural elements. Only Plan B requires an increase in potable water demand because it provides for more extensive landside facilities in comparison to other plans.

a. Inner Harbor Improvements (Plan A). This plan consists of deepening the existing entrance channel and turning basin from -35 feet MLLW to -39 and -38 feet MLLW, respectively and constructing two new breakwaters, one 900 feet in length and the other 2100 feet in length (see Figure 4). The plan has a benefit-cost ratio of 0.4 and has a total investment cost of $23.5 million with the Federal share being $23.1 million and the State share being $0.4 million. Baker's Beach is left open for harbor expansion as planned by the State. The plan effectively reduces surge problems and improves operating depths and turning within the harbor. Water circulation within the inner harbor is further reduced, but areas outside the inner harbor are unaffected. Water turbidity will temporarily increase due to dredging. The maintenance dredging frequency may be decreased from once every 10 years to once every 15 years, reducing the frequency of benthic community disturbance and associated ocean disposal impacts. The two breakwaters add new visual elements in the bay which is already dominated by the visual presence of the existing breakwater.

The breakwaters will provide rocky interstitial habitat while eliminating silt covered coralline habitat. Approximately 249,000 cubic yards of contaminated, silty-clay, dredged material will be disposed of in the ocean, depending upon the outcome of bioassay and bioaccumulation tests and approval of the action by the US Environmental Protection Agency. If the Environmental Protection Agency does not approve of the action, other alternatives for disposal of the dredged material will have to be reconsidered including land disposal, containerization or encryptment on land or in the ocean, and varying the rate of dilution and discharge into the ocean. Land disposal costs are less than ocean disposal costs within 4.5 miles of the harbor, but no land disposal sites are available within 6 miles of the harbor and land purchases will increase disposal costs. Suitability for uncontained land disposal will depend upon the results of leachate testing and U.S. Environmental Protection Agency leachate standards for land disposal of hazardous materials. Potential tsunami damage and losses will be increased by locating 2 new breakwaters within the tsunami hazard area.

b. Chamber of Commerce Plan (Plan B). This plan consists of a major realignment of the breakwater, expansion of the turning basin by dredging, and creating fill areas along the harbor side of the breakwater for container storage space, a small boat harbor, and a recreational park using the dredged material (see Figure 5). This plan has a cost-benefit ratio of 0.1 and a total first cost of $138.7 million with the Federal share being $61.4 million and the State share being $77.3 million. This plan creates the greatest environmental change in the bay in comparison with the other plans. If implemented, approximately 200 acres of reef area will be dredged and 85 acres filled. The discharge of dredged or fill material will have to conform with the US Environmental Protection Agency Section 404(b)(1), Clean Water Act,

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guidelines and possibly undergo bioassay and bioaccumulation analysis due to the presence of contaminants in the harbor sediments. The dredging and discharge of dredged material will temporarily increase water turbidity within the harbor, and eliminate 285 acres of fishery habitat on Blonde Reef. The landfill does not effect water-contact recreation activities along the Bayfront area. Potential tsunami damages and losses will be increased by locating damageable properties in the tsunami hazard area, particularly along the breakwater. The plan also realigns a portion of the historic Hilo breakwater and increases the land area adjoining the breakwater modifying the visual elements in the bay.

c. Harbor Deepening (Plan C - the Selected Plan). This plan consists of deepening the existing harbor as described and discussed in Plan A. (See Figure 7.) This plan has a cost-benefit ratio of 2.0 and a total first cost of $3.8 million with the Federal share being $3.5 million and the State share being $0.3 million. This plan causes the least amount of environmental change in comparison with the other plans. A temporary increase in water turbidity is anticipated with dredging and ocean disposal. The Environmental Protection Agency requirements, as discussed in Plan A, will have to be fulfilled. The maintenance dredging frequency for Hilo Harbor may decrease from once every 10 years to once every 15 years with the deeper water depths. This plan replaces the existing mooring buoy with a submersible one.

3.4 COMPARISON OF ALTERNATIVE IMPACTS. (See Table 3.)

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TABLE 3. COMPARISON OF ALTERNATIVE IMPACTS

Resource	Base Condition	Plan A	Plan B	Plan C
Recreation				
Beach Parks	Mooheau Park eroding	No effect	No effect on existing parks.	No effect
	Bayfront Park eroding canoeing	"	Adds new park.	"
	Wailoa River Park	"	No effect	"
	Liliuokalani Gardens and adjacent areas	"	"	"
	Coconut Island	"	"	"
	Banyan Drive shoreline	"	"	"
	Reed's Bay swimming	"	"	"
	Baker's Beach	"	"	"
	Radio Bay	"	"	"
	Radio Bay Park	"	"	"
	Hilo Breakwater fishing	Adds 2 new breakwaters	Improved access, reduced hazards, adds 3 new breakwaters.	No effect
Surfing	Coconut Island area (1)	No effect	No effect	No effect
	Wailuku River Mouth (3)	"	"	"
	Tip of Hilo Breakwater (1)	"	"	"
Fishing	Hilo Breakwater	Adds 2 new breakwaters	Improved access, adds 3 new breakwaters, eliminates 200 acres of reef.	No effect
	Shoreline areas	No effect	No effect	No effect

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TABLE 3. COMPARISON OF ALTERNATIVE IMPACTS (CONT)

Resource	Base Condition	Plan A	Plan B	Plan C
Boating	Wailoa River shoaling	No effect	No effect	No effect
	Radio Bay	"	"	"
	Reed's Bay	"	"	"
			Add new boat harbor	
Natural Hazards				
Volcanic	High risk	No effect	No effect	No effect
Tsunami	Very high risk	Increase potential damages.	Increased potential damages.	No effect
Endangered Species				
Humpback Whale (endangered)	No critical habitat in harbor, seasonal migration offshore.	No jeopardy	No jeopardy	No jeopardy
Hawksbill Turtle (endangered)	No critical habitat seen in harbor possibly foraging.	No jeopardy	No jeopardy	No jeopardy
Green Sea Turtle (threatened)	No critical habitat seen in harbor possibly foraging.	No jeopardy	No jeopardy	No jeopardy
Hawaiian Coot (endangered)	Two nests in Waiakea Pond	No effect	No effect	No effect
Migratory Waterbirds				
Ducks	Winter population in Waiakea Pond.	No effect	No effect	No effect

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TABLE 3. COMPARISON OF ALTERNATIVE IMPACTS (CONT)

Resource	Base Condition	Plan A	Plan B	Plan C
Estuaries				
Waiakea Pond		No effect	No effect	No effect
Wailoa River		No effect	No effect	No effect
Wailuku River		No effect	No effect	No effect
Terrestrial Area	None	None created	85 acres created	None created
Marine Resources				
Blonde Reef	16% coral cover, 220 acres.	6 acres covered 4 acres rocky intertidal habitat created.	200 acres dredged, 85 acres covered. 7 acres rocky intertidal habitat created.	No effect
Coconut Island Reef	10% coral cover 40 acres.	No effect	No effect	No effect
Fishery Resources	Recreational value high. Number of fish species high.	No effect	Possible decrease in resource abundance.	No effect
Water Quality	Data incomplete to compare with State Water Quality Standards. High salinity gradient.	Increased gradient in inner harbor.	No effect	No effect

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TABLE 3. COMPARISON OF ALTERNATIVE IMPACTS (CONT)

Resource	Base Condition	Plan A	Plan B	Plan C
Water Quality (Contd)	High turbidity, high nutrient concentration.	Temporary turbidity stress; 190 days.	Temporary turbidity stress; 2 years.	Temporary turbidity stress; 190 days.
	High sedimentation.	No effect or sedimentation rate, make reduce sedimentation rate in inner harbor.	No effect or sedimentation rate.	No effect
	Pollution discharges terminated.	No pollution discharges.	No pollution discharges. Increased stormwater runoff from commercial wharf areas.	No pollution discharges.
Sediment Quality	Sediments contaminated with Arsenic, PCB and Pesticides.	No change	No change	No change
Ocean Dumping	Proposed site available.	551,400 cy	No dumping required.	551,400 cy
Historic Properties Hilo Breakwater	Hilo Breakwater eligible for inclusion to National Register of Historic Places.	No effect, adds two new breakwaters.	Effect not adverse. Realignment, add 3 new breakwaters, and 85-acre landfill.	No effect
Discharge of Fill or Dredged Material	Not applicable.	200,700 cy of stone for the breakwaters.	5,242,500 cy of dredged coralline material 603,300 cy of rock). for the breakwaters and revetments.	None required.

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4. AFFECTED ENVIRONMENT.

4.1 ENVIRONMENTAL CONDITIONS.

a. Hilo is the capital and business center of the County of Hawaii. The 1980 population of Hilo was 42,320 (State of Hawaii, 1980), and continues to grow at a slow rate in comparison to the Kona side (western side) of the island. Hilo is considered a mildly depressed area with disproportionately higher unemployment than the State and has one of the lowest visitor counts in a State in which tourism is a major industry. Hilo's principal industry is sugar production, which is stable but not growing. The principal employers in Hilo are government, services and trades. The city of Hilo is situated along the shoreline of Hilo Bay and is a fully developed urban area. A University of Hawaii extension campus is located in the city together with the main county hospital, modern shopping centers and a variety of other commercial establishments. Hilo Harbor is the principal port-of-call and handles the most of cargo, agricultural and petroleum shipments in the County.

b. Hilo Bay shoreline is developed park open space as a result of local land use zoning in the tsunami hazard area. Residences are located along Baker's Beach and on Waiakea Peninsula along Banyan Drive. The developed nature of the shoreline and the high urbanized nature of the area precludes significant vegetation and wildlife habitats, except in Waiakea Pond and Wailuku River. The breakwater, Wailoa and Wailuku Rivers, and groundwater seepage into Hilo Bay are the principal factors influencing water quality in the bay. The breakwater traps freshwater discharged into the bay and reduces water circulation and exchange creating a significant salinity gradient in the bay. Sediment, cane and vegetation trash carried into the harbor by the tributaries discourage water contact recreation in the bay. Boating, recreational fishing, canoeing, and surfing are the significant water contact recreational activities in the bay. Commercial fishing in the bay has declined although the principal commercial fishing facility in the region is located at Suisan Harbor in the mouth of the Wailoa River.

4.2 SIGNIFICANT RESOURCES.

a. Recreation. Recreation occurs all along the bay shoreline. Mooheau and Bayfront beach parks extend along the bay shoreline from the Wailuku River to the Wailoa River. There is both boat berthing and open space recreation in Wailoa River Park. Liliuokalani Gardens and Coconut Islands provide open space along the Waiakea Peninsula. Reed's Bay and Baker's Beach are swimming areas relatively free of trash from the Wailuku and Wailoa Rivers. Radio Bay is used for berthing of recreational craft and the Radio Bay Park provides additional open space within the harbor area. Hilo Breakwater is a popular fishing site, despite signs warning fishermen of the hazardous conditions on the breakwater. The breakwater is frequently overtopped during high surf conditions, and waves can sweep fishermen from the breakwater. Recreational fishing is the most significant recreational activity in the bay. Fishermen use every location in the bay as a fishing site, including the harbor facilities. Boating and canoeing are also important recreational activities together with wading. Swimming is not a major recreational activity, possibly due to the highly turbid waters, and the trash in the water and on the shoreline. Five surf sites in the bay were identified by Kelly, 1981 (See Appendix B for details).

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b. Natural Hazards.

(1) Volcanic Hazards. Hilo is located in a high risk volcanic area exposed to lava flow threats, earthquakes and subsidence (See Appendix B). The risk generally decreases with distance from the northeast rift zone of Mauna Loa volcano. During the past 15 years the island of Hawaii has experienced 11 earthquakes with Richter magnitude ratings of 6 or more. The most recent in 1975 resulted in an estimated $4 million dollars of damage island wide. Most lava flows from Mauna Loa have stopped short of the Hilo suburbs. Public fears of volcanic damages and losses are still significant. At the present time, the Corps of Engineers is seeking Congressional authorization at the request of the State of Hawaii to react to threatening lava flows under emergency conditions.

(2) Riverine and Tsunami Flood Hazards. Hilo is subject to riverine flooding principally due to high intensity rainfall and surface runoff in undefined drainage ways. The flood prone areas are located within the Alenaio Stream floodplain, which is a tributary to the Wailoa River. Hilo is also subject to tsunami flood hazards. The tsunamis of 1946 and 1960 were particularly destructive resulting in the loss of 234 lives and about $52 million in property damage. After the 1960 tsunami, vulnerable waterfront areas were rezoned to open space, such as the Bayfront and Wailoa River Parks, and structural design regulations were imposed in order to reduce tsunami damages. The harbor area is located within the tsunami flood hazard area.

c. Endangered Species. The endangered humpback whale seasonally migrates through waters outside of Hilo Harbor. The whales begin to appear in November and leave the islands by the end of June. The greatest number of whales in the islands appear during February and March. The National Marine Fisheries Service indicates that no whales have been sighted inside Hilo Harbor. Data indicate that the whales concentrate at Upolu Point in northern Hawaii, and suggest that the Hilo Harbor area is not a calving, nursing and breeding area in the Hawaiian Islands. The endangered hawksbill turtle and the threatened green sea turtles have been observed in Hilo Harbor, but no nesting grounds exist in the harbor and no seasonal aggregations in the harbor have been reported. The turtles are also reported by the US National Marine Fisheries to forage along the entire coastline from Hilo to Kalapana.

d. Endangered and Migratory Waterbirds. The endangered Hawaiian coot was reported nesting in Mouholi Pond within Waiakea Pond. The pond has not been declared a wildlife refuge or critical habitat for the coot by the US Fish and Wildlife Service. During the winter season, migratory ducks are frequently seen in Waiakea Pond.

e. Estuaries. Reed's Bay, Waiakea Pond, Wailoa River and Wailuku River are estuaries within the Hilo Bay and Harbor area. Approximately 1000 mgd of freshwater is discharged into the harbor from the tributaries and springs. The estuaries are important recreational fishing areas within the bay and are planned for open space. Reed's Bay, Wailoa River and Waiakea Pond are planned by the local government for park use, and Wailuku River is planned as a natural wilderness area.

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f. Marine Resources. The two important marine areas within the bay are the areas with the greatest coral cover, Blonde Reef (16% coral cover) and Coconut Island (10% coral cover). Both the live and dead coral mass on Blonde Reef and at Coconut Island provide habitat for a variety of reef fish important to recreational fishing in the bay. Commercial fishing in the bay has declined, but the sale of the catch occurs at Suisan Harbor and fish market at the mouth of the Wailoa River. Fishermen suggest that fish stocks are declining due to over-exploitation, sedimentation and chemical pollution. However, exact factors affecting fish abundance have not been determined, although, high water turbidity reduces spear fishing success and sedimentation can bury fish shelter and food resources reducing the amount of nearshore fish habitat. Nenu (tuna fishing bait fish) resources have declined and are insufficient to support a fishing fleet. Principal nenu catch areas are located within the commercial port.

g. Water Quality.

(1) The data are insufficient to compare existing conditions with new State of Hawaii Water Quality Standards which were revised in September 1979. Based on previous standards, water quality in Hilo Bay was poor due to high nutrient concentrations, high water turbidity, high suspended solids concentration and high chlorophyll-a concentration. However, water quality is significantly improved from the past when sugar mills, the Canec Plant and the City of Hilo discharged their wastewaters directly into the bay.

(2) In general, water inside and outside the breakwater is vertically stratified due to the discharge of ground and riverine water into the ocean. The salinity gradient inside the harbor is greater than that outside due to the reduced mixing behind the breakwater. The depth of the freshwater layer in the bay reaches 20 feet indicating that mixing is occurring between surface and bottom layers, but not sufficient to reduce the salinity gradient. The depth of freshwater on Blonde Reef reaches 10 feet inside the breakwater. The primary water column mixing forces are wind and occassional ship traffic. Nutrient concentrations and suspended solids and turbidity vary with the volume of surface runoff and groundwater discharge entering. Fecal strep bacteria tend to survive longer in the bay due to the freshwater layer in the bay than other areas in the State. Chlorophyll-a concentration vary with water turbidity increasing during periods of low riverine flow and decreasing during periods of high flow. Water temperature in the surface layer is warmer than the bottom layer due to solar heating, but is colder near the source of groundwater discharge. During periods of low freshwater discharge, solar heating can warm the bottom layer because the depth of the freshwater layer is reduced.

h. Sedimentation and Sediment Quality. The sediment in the harbor entrance channel and turning basin consists of silty-clays. The low wave energy environment behind the breakwater allows much of the water-borne sediment to settle out in the harbor and on Blonde Reef where the sediment smothering and destroying the reef ecosystem. The rate of sedimentation may be slow based upon the frequency of maintenance dredging in Hilo Harbor -- once every ten years. In 1977, about 54,000 cubic yards of material was removed from the harbor during the maintenance cycle and the material was disposed of by ocean dumping at the EPA approved Hilo ocean disposal site. However, about 35,000 tons of silt per year are deposited in the bay from the Wailuku River, the quantity may be less than in the past, because a 1881 lava flow, covered up erodible soils within the Wailuku River drainage basin and

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the discharge of 20,000 tons of sediment a year from the Wainaku Sugar Mill was terminated in 1976. Based upon sediment analysis by the State Department of Health, Hilo Bay sediments are contaminated with arsenic, PCB and chlordane. Arsenic trioxide was discharged into Waiakea Pond by the Canec Plant. The PCB's probably orginated from the Shipman Power Plant near the Wailoa River. Chlordane probably occurs due to agricultural activities and use as a termicide in home construction in Hilo.

TABLE 4

Contaminant Concentration in Hilo Harbor Sediments.

Total Arsenic concentration: Range from 33-104 ppm

PCB concentration: a mean value of 200 ppb

Chlordane concentration: a mean value of 2-84 ppb

Source: State of Hawaii 1978

Tests of crab and fish tissue indicate that arsenic and PCB are not bioconcentrating in the tissue. Fish viscera contained chlordane residue in concentrations 3-4 times higher than the flesh, where concentrations ranged from 80-160 ppb.

1. Ocean Disposal Site for Dredged Material. In 1981, the US Environmental Protection Agency designated a permanent ocean disposal site for dredged material of Hilo Harbor. The site is located 8 miles northeast of Hilo Harbor in ocean depths ranging from 330 to 340 meters. The surface currents in the area ranged in velocity from 15 to 36 cm/sec in a predominantly northwesterly direction. The bottom sediment was silty clay, and the site is also located outside of the major commercial fishing grounds. The dump site is not a site of upwelling. In 1977, about 54,000 cubic yards of dredged material from Hilo Harbor were discharged at the dump site. In 1962, approximately 85,000 cubic yards of dredged material was removed from Hilo Harbor and disposed of in the ocean offshore from Hilo.

TABLE 5

EPA Dredged Material Disposal Site for Hilo Harbor

Location: Center Point Latitude 49° 48" 30" N
Longitude 154° 50' 30" W

Size: Circular with radius of approximately 920 meters

Primary Use: Dredged Material

Period of Use: Continuing use

Restriction: Disposal shall be limited to dredged material

Source: Federal Register, (46)115: June 16, 1981 (31412).

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j. Air Quality. Air quality in Hilo is good, lacking major industrial emissions. The sulfur dioxide concentration in 1980 was less than 5 micograms per cubic meter. Volcanic gases, agricultural fires, sugar mills, both aircraft and automotive engines and the power plant are the only major sources of air pollution in the Hilo area.

k. Noise. Hilo is a quiet urban area with the exception of aircraft landing and taking off from Hilo Airport, the aircraft landing pattern takes aircraft over the bayfront area.

l. Historic Resources. The Hilo Breakwater was determined to be eligible for inclusion to the National Register of Historic Places by the Keeper of the Register in 1980. The Keeper of the Register indicated that the breakwater was significant to Hawaii Island commerce and transportation for the vital role that it played in the development of the port of Hilo, the historic main port of entry for the island of Hawaii, and that the breakwater has retained its essential physical integrity despite alterations to its original design, function and visual appearance. The State Historic Preservation Officer had indicated that the breakwater was associated with events that facilitated railroad and port expansion in Hilo, that reestablished Hilo as the hub of transportation on the island of Hawaii and that contributed to the growth of Hilo. The 2-mile long breakwater is also the longest breakwater in the State and continues to be a visible entity in the bay. For 50 years the breakwater has been a major visual element in Hilo Bay despite damage by tsunamis.

5. ENVIRONMENTAL EFFECTS.

5.1 Social. The improvements will not alter Hilo's population growth or influence its existing economic trend. No people, farms or businesses will be displaced. The harbor remains in industrial and commercial use, and management will remain with the State of Hawaii.

5.2 Recreation. None of the plans will have a direct impact on existing park areas in Hilo Bay. The construction of two new breakwaters in Plan A will attract fishermen and increase the amount of fishing sites in Hilo Bay, despite warnings that the fishing locations on the breakwaters are hazardous. Plan B provides the largest increase of recreational fishing area by creating 85 acres of land area from Blonde Reef for use as park, small boat harbor and container storage. Plan C makes no contribution to recreation in Hilo Bay and will not degrade existing recreation resources.

5.3 Natural Hazards.

a. Volcanic Hazards. None of the plans increase volcanic hazard risks.

b. Tsunami and Riverine Flood Hazards. None of the plans affect riverine flooding along the Alenaio Stream floodplain. Plan B increases the amount of damageable property, i.e., container storage, small boat harbor, located within the tsunami hazard zones. Plan A located two new breakwaters in the tsunami hazard area also increasing potential tsunami damages.

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5.4 Endangered Species.

a. Endangered humpback whale. None of the plans will affect the migratory route of the humpback whale, or any critical whale calving, nursing or breeding areas in Hawaii. Ocean disposal of dredged material under Plans A and C would occur in offshore waters used by the whales. If the dumping was conducted during the migratory season, the dumping would not hinder whale movement through the area. The operation of the conveyance vessel would create underwater sounds which the whales may find unpleasant, but should not affect their migration. In Glacier Bay, Alaska, the operation of tour boats averaging about 100 tons displacement appeared to interfere with whale feeding and possibly their use of the area. However, during their migration through Hawaiian waters, the whales are not known to feed and are not confined in an embayment.

b. Endangered hawksbill turtle and threatened green sea turtle. Plan C involves the least modification to the existing harbor and does not alter available foraging in Hilo Harbor. Plan D involves the greatest change to the existing harbor and eliminates 285 acres of Blonde Reef, which may be used for foraging by the turtles. None of the plans would affect turtle nesting areas or areas of turtle aggregations in Hawaii. The plans would not eliminate foraging area along the coast outside of Hilo Harbor.

c. Endangered Hawaiian Coot. None of the plans involve modification of Waiakea Pond where the endangered Hawaiian Coot was reported nesting.

5.5 Migratory Waterbirds. None of the plans involve modification of Waiakea Pond where migratory ducks have been observed.

5.6 Estuaries. None of the plans involve work in the Wailuku River, Wailoa River, Reed's Bay estuaries.

5.7 Marine Resources.

a. Dredging in Hilo Bay will involve removing material from Blonde Reef and the silty areas in the commercial port. The activity will eliminate resident benthic infauna within the dredged areas and will temporarily increase siltation and turbidity stress in adjacent areas. Recolonization of dredged and stressed areas is anticipated, but species diversity on Blonde Reef will be lowered by decreasing the available hard substrate and creating more silty habitat. Recolonization of the silty mud environment will occur more quickly and by different species compared to damaged coral areas because of the homogenity of the habitat and the relatively high mobility and tolerance of the fauna to sediment compared to reef organisms attached on the solid substrate. However, the benthic faunal assemblage will be less diverse than the reef.

b. During dredging, an artificial feeding situation will develop as predatory fish will exploit food resources displaced, exposed, or stirred up by the dredging activities. This fish concentrating effect will attract fishermen to the area. The loss of a portion of Blonde Reef is not expected to eliminate the presence of any fish resource in the bay, but it may influence the abundance of some species by reducing available reef habitat.

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c. Plans A and C involve removing silt from 80 acres of muddy, silt bottom habitat within the existing harbor entrance channel and turning basin. The loss of any benthic infaunal organisms would be typical of the impact associated with present periodic maintenance dredging activities. The dredging activities would temporarily increase water turbidity adding to the sedimentation and turbidity stress already experienced in the harbor and on Blonde Reef. The extent of turbidity and sedimentation stress cannot be accurately predicted in light of the heavy siltation and turbidity present in the harbor due to the Wailuku River. However, the extent of stress maybe grossly estimated based upon the number of days it takes to complete the dredging action. Plan B involves dredging and filling 200 acres of Blonde Reef reducing the available coral and fishery habitat in Hilo Bay and temporarily increasing sedimentation stress. The Plan will create 120 acres of silt habitat which would have a lower diversity of organisms and a lower abundance of recreationally important fish.

5.8 Water Quality.

a. All plans involve dredging and a temporary increase in water turbidity as a result of dredging. The impact is a cumulative impact which adds to the stress already created by the influx of sediment from the tributaries entering Hilo Bay. Usually the color of the water returns to normal within a day after each dredging operation, but transmissiometer and visual underwater observations indicate that fine sediments remain in suspension longer obscuring underwater visibility. The duration of dredging is used as a gross indicator of the extent of turbidity change anticipated. None of the plans affect the amount of sediment carried into the harbors, but the changes to the current patterns in the bay will alter the sedimentation patterns.

b. Hilo Harbor has a silty-clay bottom and deepening the channel and turning basin from -35 feet MLLW to -39 feet and -38 feet MLLW, respectively could probably be performed using a hopper dredge (ship type dredge with suction booms and dredge material storage bins (hoppers)) during a normal maintenance dredging cycle. However, hydraulic suctions dredges and mechanical clamshell dredges could also be used. The hydraulic dredge could pump fluid mud from the harbor bottom into a barge which would be towed to the dump site. Overflow water usually contains fine silt and creates a highly turbid plume. Clamshells or draglines without containment buckets also cause turbid plumes, but the cohesive clays stay within the bucket. While material falling from the bucket and water draining from the bucket contribute to water turbidity, a fluid mud condition, where the sediment is entrained in a large volume of water, is not created. In dredging the harbor under Plan B, where the dredged material is used for construction material, a hydraulic cutter head dredge would probably be used and the material pumped to the contained, fill site. Turbidity plumes would also be expected, but the containment area confines the discharged dredged material slurry, allowing time for the material to settle out from the water. Water returning to the harbor could be less turbid than the harbor water, if sufficient settling time is allowed within the containment area.

c. Sedimentation and turbidity stress related to dredging is dependent upon the characteristics of the material being dredged, the type of dredge used, and the direction and strength of water currents in the dredge area. The material dredged from Hilo Harbor is expected to consist of silty-clays

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from the existing harbor channel and basin, and coralline rubble and rock aggregate from Blonde Reef. Blasting may be required. A suction dredge with barge and a mechanical dredge, clam shell or dragline, have the potential of increasing suspended sediment load, turbidity conditions, and siltation stress because water turbulence and water draining from the bucket and barge can wash dredged material into the bay. Hydraulic suction dredges combined with land disposal of dredged spoils create the least amount of water turbidity since material and water are drawn from the bottom and pumped to a retention pond where sediment is allowed to settle out of the water. Leaks from the pipelines and physical disturbance of the bottom are primarily responsible for turbid plumes associated with hydraulic dredging. The material previously dredged from Hilo Harbor during the 1977 maintenance dredging consisted entirely of silty-clay; 50% of the material had a grain size smaller then 0.010 millimeters. While most of the material dredged may be plastic and cohesive, some loose fine material can be washed into the water where the material can remain in suspension for a considerable length of time. For example, a particle with a grain size of 0.10 can take about 33 minutes to settle 1-foot in the absence of strong currents. Dredging on hard coral and rock can create fine silt particles, but most of the material will probably be coarse to medium size material with large grain sizes that can settle out quickly. For example, particles with grain size in the range of 5 to 1 mm can settle 1-foot in 0.3 to 3 seconds. Much of the fine material suspended by dredging on hard substrates is usually material which has settled out from the water column. Drogue studies (Reference M. & E. Pacific, 1980) indicate that water currents will carry turbid water from the commercial harbor out to the harbor mouth. However, the closer dredging is located to Blonde Reef, the greater the possibility that suspended silt will be carried over the reef.

d. Rough calculations indicate that current velocities in the commercial harbor range from 0.03 to 0.19 knots and can convey non-cohesive fine silt particle (size 0.10 mm) a long distance (9,200 feet based on a particle settling velocity of 0.0005 feet/second, current speed of 0.3 knots, and water depth of 16 feet) from the dredge site. Coarse material (size 5mm) can settle out within 14 feet of the dredge site (based on particle settling velocity of 0.33 feet/second, water depth of 16 feet and current speed of 0.3 knots). Medium grained material will probably have a more detrimental effect on reef life than fine or coarse material. The medium material is expected to have a settling rate which may exceed tolerance of some benthic species. The material will settle out within moderate distances from the dredge, where it can bury or smother benthic organisms, and cannot easily wash from the surface under reduced wave conditions experienced in Hilo Bay. While turbidity can induce stress to photosynthetic organisms, the effect is temporary as water clarity will return to ambient levels after termination of dredging. The period of stress may be long, depending upon the length of time required to complete the dredging, and can be aggravated by rainfall induced turbidity. Periodic rainstorms impart similar sediment stresses in Hilo Bay because large amounts of sediments can be discharged from rivers and streams entering the bay.

e. The breakwaters in Plan A further restrict mixing within the inner harbor and will possibly increase the salinity gradient within the harbor due in part to the groundwater discharge in the inner harbor. The groundwater discharge will probably create a net surface outflow from the harbor and may tend to keep sediment laden water from the tributaries out of the harbor basin possibly reducing the rate of sedimentation in the harbor turning basin.

f. Plan B reduces the water surface area in the harbor by 85 acres and deepens 200 acres of the harbor. The shallow areas in the harbor have a good rate of water exchange due to tide and movement of the top layer of water in comparison to the deep areas in the harbor where tidal movement is the principal factor affecting water movement and exchange. The increased land surface area along the breakwater increases surface runoff from the commercial and industrial area which will contribute roadway pollutants into the bay.

g. Plan C does not affect water quality in the bay because it involves the least modification to the existing bay environment. The anticipated increase in ship traffic in the bay may also help to improve water column mixing, as the ship propellors create forces which mix the two water layers in the bay.

h. Sediment Quality. None of the plans will improve or further degrade sediment quality. The removal of 249,000cubic yards of contaminated sediment in Plans A and C may temporarily improve conditions in the bottom for infaunal organisms, but the continued movement of contaminants from inland and upland sources into the bay and the movement of contaminated sediment in the bay into uncontaminated areas maintains existing conditions in the bay sediment quality.

5.9 Ocean Dumping.

a. The probable impacts of ocean dumping are discussed in the Corps of Engineers, "Final Environmental Impact Statement Harbor Maintenance Dredging in the State of Hawaii," 1975, and the US Enviromental Protection Agency, "Final Environmental Impact Statement for Dredged Material Disposal Site Designation", 1980. In summary, the dump site has a silty-clay substrate and is dominated by a polychaete infauna. The level of biological activity is lower than in shallower coastal waters. The site is not a significant commercial fishing ground. The water depth and coastal currents provide significant dilution and dispersion of the dredged material. Agitation of the dredged material in the water column may create a temporary nutrient increase and a temporary depression in dissolved oxygen concentrations. Short-term biostimulation may occur, together with mounding and faunal shifts on the

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bottom. Suspended sediment load and water turbidity will temporarily increase. Some plankton may be entrapped in the sediment falling through the water column. The material deposited on the ocean bottom will smother some organisms, but repopulation is anticipated. Toxic effects and pollutant accumulation are possible, and bioassay and bioaccumulation tests performed prior to disposal will be used to assess the effects of the material on test animals representing the population of both the dump and dredging sites. In accordance with US Environmental Protection Agency regulations, bioassay and bioaccumulation tests on the dredged material will be performed and the results submitted to EPA for their review and approval of the ocean dumping activity. The tests are designed to predict toxic effects of the dredged material on organisms representative of the dump site and any bioaccumulation which might occur. However, the use of representative organisms does not accurately predict conditions and consequences which may occur in the actual deep ocean environment where organisms and environmental conditions are poorly studied and not well documented or researched.

b. State Department of Health analysis of sediment samples from Hilo Bay suggest that dredged material from the silty environment contain high concentrations of arsenic, PCB and chlordane. The results of bioassay and bioaccumulation analysis may find the material unsuitable for ocean dumping in accordance with EPA criteria. However, the presence of the pollutants may also make it unsuitable for land disposal. If so, the material may have to be either mixed with non-toxic material to dilute its toxicity, packaged prior to disposal, incinerated, biologically or chemically treated, or discharged into the ocean at a low rate to allow adequate dilution. In the aquatic environment, the pollutants, especially heavy metals, are in a stable physiochemical environment not subject to wide variations in pH or reduction-oxidation (redox) potential. Thus, the pollutants tend to be bound to the sediments and not readily available for biological uptake. When sediments are stirred up either by wave energy or dredging, the concentrations of pollutants initially increases, but rapidly decrease as the materials are oxidized.

5.10 Upland Disposal. In upland disposal sites, the dredged material undergoes a wide variation in pH and redox potential, and pollutants are readily released from the material. The presence of the pollutants can toxify the soil, preventing the growth of plants or limit the availability of other nutrients needed for plant growth. The pollutants can also be leached from the soil into the groundwater where they can possibly be conveyed into coastal waters by spring water or into subsurface drinking water sources. Plants may be able to bioconcentrate some of the pollutants, possibly removing the pollutants from the soil and limiting their availability in the environment. Initially soil salinity of the dredged spoil will prevent the growth of plants, except for those with a high salt tolerance. The salt will be leached from the material by rainfall, eventually permitting the growth of some vegetation. Because of the potential adverse environmental effects, a suitable land disposal site should not be adjacent to potable groundwater sources and should not be in agricultural use if the material to be disposed of is potentially toxic. Erosion control methods will have to be employed to keep the material within the disposal site. If the dredged material is found to have significant amounts of toxic material that could form leachates, disposal may require use of an approved hazardous waste disposal site. No such sites are in Hawaii. Leachate tests will have to be performed on the

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contaminated dredged material to determine the potential of toxic materials leaching from the material. In Hawaii, leachates can percolate through the porous volcanic material and enter the groundwater, possibly contaminating drinking water sources or municipal water supplies. Encryptment, impervious linings and locating the disposal site close to the shore where the groundwater is unsuitable for drinking may be alternatives used in land disposal. The dredged material in Plans A and C consists of silty-clays, which are unsuitable as construction material, but may be used as sanitary landfill cover. The dredged material in Plan B consists of coralline material suitable for fill, which would be used to create the land areas along the breakwater.

5.11 Air Quality. Only Plan B has the potential for affecting air quality. The dredged material will be a source of dust until the areas are improved, or paved. The only habitated areas that will be affected are the homes at Baker's Beach and the hotels along Banyan Drive.

5.12 Noise Quality. None of the plans will result in a long term increase in noise. The operation of equipment in the construction of the breakwaters and dredging and filling in Plan B will be temporary noise sources. The duration of construction is a gross measure to the extent of the noise pollution. (See Water turbidity, Table 2.) The only habitated area which will be affected are the homes along Baker's Beach and the hotels along Banyan Drive.

5.13 Historic Resources. Plans A and C were determined to have no effect on the breakwater, and Plan B was determined to have no adverse effect on the historic breakwater. However, both Plans A and B alter visual elements in Hilo Bay including the visual integrity of the breakwater.

6. PUBLIC INVOLVEMENT

6.1 PUBLIC INVOLVEMENT PROGRAM. The public involvement program has consisted of meetings and workshops with the public at large, meetings and workshops with members of the Federal, State, and County agencies, and the distribution of various reports and documents resulting from studies conducted under the Hilo Area Comprehensive Study to the public and agencies concerned with the progress of the study. In total, 10 public meetings were held including the initial public meeting in 1976, and eight technical studies have been released to the public. Tsunami hazards were the most frequent concern expressed by the public and the agencies. Surge (ship motion) in Hilo Harbor was the most frequent problem mentioned for deep-draft navigation, and beach restoration of the Bayfront beach was the most frequent recreational need. A public meeting was held in Hilo on 17 September 1981 to discuss the findings presented in the draft report and environmental impact statement. The public expressed a desire to improve water quality in the bay, but did not express a plan preference. The State Harbors Division expressed preference for Plan C.

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6.2 REQUIRED COORDINATION. The following coordination must be completed with the following agencies:

a. Coastal Zone Management Act. If Plans A or B are recommended for implementation, a Federal Consistency Statement would have to be requested from the State of Hawaii, Department of Planning and Economic Development, Coastal Zone Management Office. A Federal Consistency Statement for Plan C was obtained from the State of Hawaii.

b. Endangered Species. If Plans A or B are recommended for implementation, the National Marine Fisheries Service would be requested to make a determination of project effect on the endangered humpback whale, endangered hawksbill turtle and the threatened green sea turtle. A determination of no effect on the threatened and endangered species was received for Plan C. Coordination with the National Marine Fisheries Service will continue concerning the ocean disposal of the dredged material under the Marine Protection, Research and Sanctuaries Act.

c. Marine Protection, Research and Sanctuaries Act, (Ocean Dumping Act). Bioassay and bioaccumulation test procedures need to be developed and approved by US Environmental Protection Agency, and the tests performed prior to ocean disposal of dredged material in Plans A and C. The results of the test must be coordinated with the US Environmental Protection Agency, which will decide whether or not to permit the ocean dumping of the dredged material. A public notice of intent to dispose of the dredged material in the ocean will be released following the completion of the tests.

d. State and County Approvals. The State of Hawaii, Department of Transportation, is responsible for obtaining all necessary local permits and approvals and satisfying the requirements of Chapter 343, Hawaii Revised Statues and EIS Regulations. The Federal EIS and CZM consistency request discussed the construction impacts and compatibility of the action to local coastal zone management policies, but did not address actions to be planned by the State.

6.3 STATEMENT RECIPIENTS. The following agencies and public-at-large were sent copies of the draft environmental statement and survey report. An asterisk following the name indicates that letters were provided in response to the draft reports.

Federal Government

US Advisory Council on Historic Preservation
  Washington DC Office
  Western Project Review Office
US Environmental Protection Agency
  *Office of Environmental Review - no comment
  *Region IX
  Pacific Islands Office
US Army Corps of Engineers
  Coastal Engineering Research Center
US Department of Agriculture
  Institute of Pacific Islands Forestry
  Soil Conservation Service
  Hawaii District Office

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Federal Government (Cont)

US Department of Energy
US Department of Commerce
Secretary of Environmental Affairs
National Marine Fisheries Service
* Southwest Region Office
Pacific Program Office
Office of Coastal Zone Management
National Weather Service, Pacific Region
US Department of the Interior
Office of Environmental Review
US Geological Survey, Hawaii Volcano Observatory
Secretary Field Representative, Pacific Southwest Region
US Fish and Wildlife Service
Regional Office
Pacific Islands Office
Endangered Species Coordinator
National Park Service
Office of Archaeological and Historic Preservation
Interagency Archaeological Service
Arizona Archaeological Center
Pacific Southwest Region Office
Hawaii State Office
* US Department of Housing and Urban Development - no comment
US Department of Health, Education and Welfare
US Department of Transportation
* Federal Highway Administration - no comment
14th Coast Guard District
Cape Small, Hilo
Federal Maritime Commission

State Government

Governor George R. Ariyoshi
Hawaii Congressional Delegation
Department of Planning and Economic Development - Clearinghouse
Department of Health
* Office of Environmental Quality Control
International Tsunami Information Center
* Department of Land and Natural Resources
* State Historic Preservation Officer
Division of State Parks
Division of Fish and Game
Forestry and Wildlife Division
Forestry and Wildlife Division
Land Management Division
Water and Land Development Division
Conservation and Resources Enforcement Division
Hawaii District and Agent
Board of Land and Natural Resources
Marine Affairs Coordinator
* Department of Transportation
Highways Division
Harbors Division

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State Government (Cont)

Department of Accounting and General Services
Attorney General
* State Department of Agriculture
Board of Agriculture
Public Utilities Commission
Hawaii State Library
Hawaii Island Branches
Department of Hawaiian Home Lands
Keaukaha School

County Government

Mayor Herbert T. Matayoshi
Hawaii County Council
Hawaii Legislative Delegation
Department of Parks and Recreation
Department of Planning
Planning Commission
Department of Public Works
Department of Research and Development
Department of Water Supply
County Fire Department
Department of Civil Defense

Organizations

Big Island Resource Conservation and Development Council
Big Island Casting Club
Association of Hawaiian Civic Clubs
Big Island Fish and Game Association
Conservation Council for Hawaii
Hawaii Island Chapter
Hale Consultants, Inc.
Hawaii Audobon Society
Hawaii Community College Library
Hawaii Electric Light Co.
Hawaii Island Board of Realtors
Hawaii Island Chamber of Commerce
Hawaii Tribune Herald
Hawaiian Civic Club
Hawaii Leeward Planning Conference
Hilo Transportation and Terminal Co., Inc.
Hilo Trolling Club
Hawaiian Paradise Park Corp.
Hilo Sailing Club
Life of the Land
Kalapana Community Association
Hilo Downtown Improvement Association
Kailua Trolling Club
Kawaihae Trolling Club
Japanese Chamber of Commerce and Industry of Hawaii

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Organizations (Cont)

Kona Mauka Troller, Inc.
Kona Yacht Club
Mark's Boat Works
North Hilo Community Council
Moku Loa Sierra Club Group
Matson Navigation Co.
Puna Community Council
Suisan Co.
Save Our Surf
University of Hawaii
Water Resources Research Center
Library
* Environmental Center
Hawaii Institute of Marine Biology
Seagrant/Marine Advisory Program, Kona and Hilo Offices
Young Brothers Inc.
Wester Division Project Review, Lake Plaza South

Individuals

Mr, Alika Cooper
Mr. Dan Pakele
Mr. Dave Soderland
Mr. Edward Bumatay
Mr. Herbert Mann
Ms. Lei Keliipio
Mr. Paul Friesema

E.4 PUBLIC VIEWS AND RESPONSES

a. Federal Agencies.

(1) The National Marine Fisheries Service, Southwest Region, indicated that Plan C was not likely to affect the threatened green sea turtle, the endangered hawksbill turtle, or endangered humpback whale. Coordination will continue concerning ocean disposal of the dredged material.

(2) US Environmental Protection Agency (EPA). EPA had no objections to the proposed action and felt that the Draft EIS adequately sets forth the environmental impact of the proposed action, as well as reasonably available alternatives. EPA also indicated that Plan B would not comply with Section 404(b)(1) guidelines because the discharge of dredged or fill material occurred on a coral reef, a special aquatic site where the discharge of dredged or fill material is prohibited when practicable, less damaging alternatives are available, such as Plans A or C. However, Plan A involves discharge of dredged or fill material on Blonde Reef, and destroys less reef than Plan B.

b. State of Hawaii Agencies.

(1) Department of Land and Natural Resources, preferred Plan C provided efforts were taken to minimize sedimentation during dredging. Plan C was noted as not destroying the marine habitat in Hilo Bay.

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(2) Department of Agriculture indicated that improvements to Hilo Harbor would benefit the agriculture industry.

(3) Department of Health, Office of Environmental Quality Control.

Comment: The Draft EIS does not reflect the participation of the State Department of Transportation as required by CEQ NEPA Regulations and Chapter 343, Hawaii Revised Statutes.

Response: The combining of the Federal and State EIS requirements is not mandatory under the quoted regulations. The State Department of Transportation could not participate in a joint EIS process within the schedule established by the Honolulu Engineer District. The Federal EIS could be adopted by the State Department of Transportation, particularly with respect to the implementation of Plan C, since the action does not require any particular, additive actions by the State to implement the plan.

Comment: In Section 6.2, Required Coordination, "State NEPA Requirements," should be changed to "requirements of Chapter 343, Hawaii Revised Statutes and the EIS Regulations."

Response: The change was incorporated as requested.

c. Other Organizations.

(1) University of Hawaii, Environmental Center.

Comment: The data base for Hilo is very small. Circulation, stratification and wave height data for a variety of conditions in Hilo Bay should be gathered before arriving at a decision to implement any structural changes.

Response: The data base used in the planning process is sufficient to make decisions concerning plan selection. As a result of the study, data on tsunami hazards, circulation, stratification and biology was compiled over several different seasons (See Bibliography. Neighbor Island Consultants, 1973; Resources Planning, Inc., 1977; Sunn, Low, Tom and Hara, 1977; U.S. Fish and Wildlife Service, 1977, and M&E Pacific, 1980). Previously, there was little or no data concerning Hilo Bay water resources.

d. No comments were received from the County of Hawaii agencies, special interest groups or individuals.

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Name	Expertise	Experience	Professional Discipline
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Mr. William B. Lennan	Zoology	BA, Zoology; BS, 2 years post-graduate studies; University of Hawaii; 2 years fishery biologist, US Fish and Wildlife Service.	Fish and Wildlife assessment.
Dr. James E. Maragos	Marine Ecology	BS, Zoology; PhD, Oceanography; 2 years post-doctoral research; 8 years environmental consultant; 7 years EIS studies, Corps of Engineers.	Review, overall impact assessment. Corps NEPA Coordinator
Mr. David G. Sox	History and Culture	BA, MA Geography; 6 years research; 4 years EIS studies; Corps of Engineers.	Cultural and historical impact assessment.

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